Chapter III

Emergency Treatment of Injuries

Section A
INTRODUCTION

FIRST AID IS THE EMERGENCY TREATMENT given to the ill or injured before professional medical services can be obtained. It is given to prevent further injury or death, to counteract shock, and to relieve pain. Certain conditions, such as severe bleeding or asphyxiation, require *immediate* treatment if the patient is to survive. In such cases, seconds might mean the difference between life and death. However, the treatment of most injuries or other medical emergencies may be postponed safely for the few minutes required to locate a crew member skilled in first aid, or to locate suitable medical supplies and equipment.

All crew members should be prepared to administer first aid. They should have sufficient knowledge of first aid to be able to apply true emergency measures and decide when treatment can be delayed safely until more skilled personnel arrive. Limitations must be recognized. Procedures and techniques beyond the rescuer's ability should *not* be attempted. More harm than good might result.

The person responsible for administering first aid should think and act carefully, and not become unduly excited or emotionally upset. Unnecessary haste and the appearance of uncertainty or confusion should be avoided.

First aid must be administered *immediately* to:

- Restore breathing
- Control bleeding
- Remove poisons
- Prevent further injury to the patient, such as his removal from a room containing carbon monoxide or smoke.

A rapid, emergency evaluation of the patient should be made immediately at the scene of the injury to determine the type and extent of the trauma. Because seconds may count, only the essential pieces of the patient's clothing should be removed. The rescuer must be prepared to observe, speak to the patient, and act *all at once.*

The patient's pulse should be taken. If it cannot be felt at the wrist, it should be felt at the carotid artery at the side of the neck. If there is no pulse, cardiopulmonary resuscitation must be started (see p. IV–1). The patient should be treated for shock if the pulse is weak and rapid, or the skin pale, cold, and possibly moist, with an increased rate of shallow, irregular breathing. The patient should be kept in the best position that provides relief from his

injuries. Usually this is lying down, which increases circulation of the blood to the head. The patient should *not* be moved if injuries of the neck or spine are suspected. The patient should be covered to prevent loss of body heat.

The patient should be observed for the type of breathing and possible bleeding. If not breathing, mouth-to-mouth ventilation or mouth-to-nose ventilation must be given (see p. IV–1+). The opening of a sucking wound of the chest must be closed (see p. III–47) to prevent air from flowing in and out of the chest cavity as the patient breathes. The fractured ribs of a flail chest should be splinted (see p. III–40) because the chest wall between the breaks will collapse instead of expanding when the patient tries to inhale. Severe bleeding *must* be controlled.

During this time, the patient if conscious should be reassured and told that all possible help is being given. The rescuer should ask about the location of any painful areas. Also, talking with the patient will help the rescuer to determine the state of consciousness and any reaction to the injury. There may be the presence or absence of consciousness, mental dullness or confusion, anxiety or fear, overactivity or excitement, and complaints of abnormal sensation.

Once lifesaving measures have been started or deemed not necessary, the patient should be examined more thoroughly for other injuries. If necessary, additional clothing of the patient may be removed, including constricting articles such as belts. The patient should be kept in a lying-down position and moved only when absolutely necessary. The general appearance of the patient should be observed, including any signs and symptoms which may indicate a specific injury or illness. Signs of a head injury should be sought, and the eyes examined for a reaction of the pupils to light. Deformities and wounds indicating a fracture are important. The patient should be asked about any lack of motion, tenderness, or pain. *Fractures should be splinted before moving a patient (see p. III–33+).* No attempt should be made to set the fracture.

The rescuer should ask if the patient can move either the arms or legs. If neither arms nor legs can be moved, the neck probably has been injured. The spine probably is injured if the arms can be moved, but not the legs. *When these conditions are present, a spine board must be used to move the patient (see p. III–37).* Any loss of sensation is serious and should be treated as a spinal cord injury.

Wounds and most burns should be covered to prevent infection. The treatment of specific injuries will be discussed more fully in the rest of this chapter.

Always remember that the rescuer will be expected to provide assistance to the patient, until the patient is placed in the care of qualified medical personnel.

- **Types of Wounds**
  - Abrasions
  - Avulsions
  - Contusions
  - Incisions
  - Lacerations
  - Punctures
- **Control of Bleeding**
  - Direct Pressure
  - Elevation
  - Pressure Points
  - Tourniquet
- **Shock**
- **Treatment of Wounds**
  - Removal of Foreign Matter
  - Cleansing the Wound
  - Blood Blisters (Hematomas)
  - Animal Bites
  - Human Bites
- **Infection**
- **Bandaging**
  - Butterfly
  - Roller
  - Chest or Back
  - Chest or Abdomen
  - Shoulder or Hip
  - Hand or Foot

Chapter III

Emergency Treatment of Injuries

Section B

WOUNDS

A WOUND IS AN INJURY caused by external physical forces. An *open wound* is one where the skin or mucous membranes have been broken. A *closed wound* occurs when underlying tissues are involved and the skin and mucous membranes are intact. In wounds there is an immediate risk of hemorrhage, after which the greatest danger is infection. Thus disinfection of the wound should follow first aid procedures. Other concerns will be shock, nerve injury, and the extent of tissue destruction.

TYPES OF WOUNDS

Abrasions

An abrasion is an open wound that is caused by rubbing or scraping the skin. (See Fig. 3–1.) The wound may be quite painful when large areas of skin are scraped off. An abrasion usually is not very deep and bleeding is limited to an oozing from damaged capillaries and small veins. There is a danger of infection from bacteria usually ground into the wound with dirt, grease, and other foreign matter.

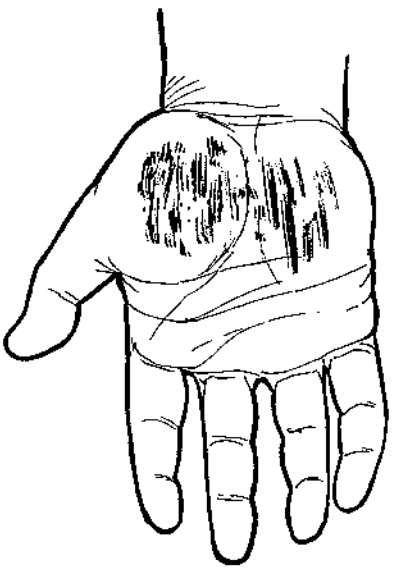


Fig. 3–1. Abrasion.

Avulsions

An avulsion is an open wound that may be caused by explosions, accidents from vehicles, heavy machinery, and animal bites. (See Fig. 3–2.) Tissue is separated forcibly or torn with loss of skin and soft tissue. Heavy bleeding usually follows immediately.

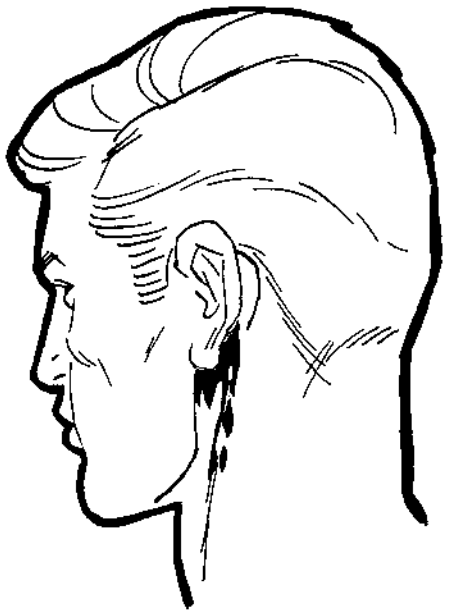


Fig. 3–2. Avulsion.

Contusions (Bruises, Blood Blisters)

A contusion is a closed, superficial wound usually caused by a blow from a blunt object, a bump against a stationary object, or a crush. Blood seeping into soft tissues from injured vessels and capillaries causes swelling and pain that may be severe at the site of the injury. If the injury is over a bone, the possibility of a fracture should be kept in mind.

Incisions

An incision is an open wound caused by sharp objects as knives, broken glass, and sharp metal edges. (See Fig. 3–3.) The wound is smooth-edged and bleeds freely. The amount of bleeding depends upon the depth, location and size of the wound. There may be severe damage to muscles, nerves, and tendons if the wound is deep.

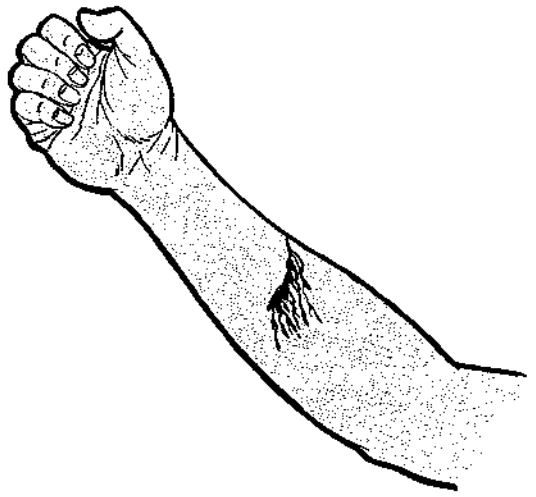


Fig. 3–3. Incision.

Lacerations

A laceration is an open wound caused by objects as dull knives, broken glass, stones, moving parts of machinery, and direct blows. (See Fig. 3–4.) The edges of the wound usually are jagged and irregular, and pieces of tissue may be partly or entirely pulled away. Bleeding may be scant or rapid and extensive. Contamination of the wound with dirt, grease, or other material increases the chance of infection.

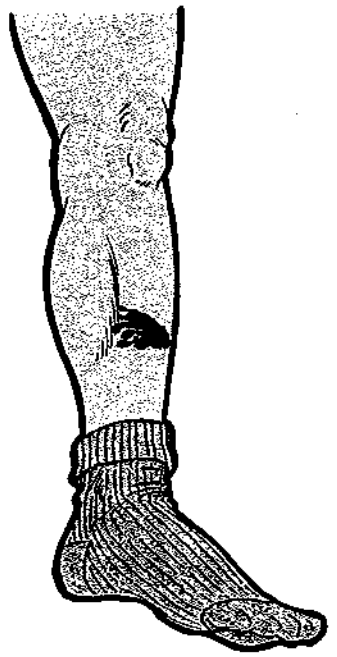


Fig. 3–4. Laceration.

Punctures

A puncture is an open wound caused by such objects as wooden or metal splinters, knives, nails, fishhooks, ice picks, and bullets. (See Fig. 3–5.) Although the opening of a puncture wound may be small with minor external bleeding, the object may penetrate far into the body to cause internal hemorrhage and injure organs. Because the wound is not cleansed by external bleeding, the chance of infection is increased, including possible tetanus (lockjaw) or gas gangrene.

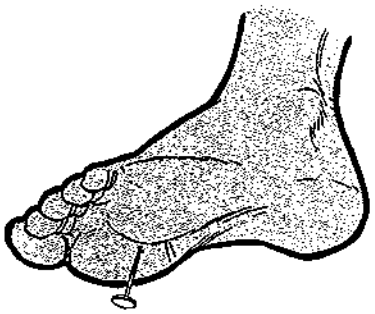


Fig. 3–5. Puncture.

CONTROL OF BLEEDING

The human body contains approximately six quarts of blood. A healthy adult can lose up to one pint of blood without developing harmful effects, but the loss of more than a quart can be life-threatening. Hemorrhage from major blood vessels of the arms, neck, and thighs may occur so rapidly and extensively that death occurs in a few minutes. Hemorrhage must be controlled immediately to prevent excessive loss of blood. In any medical emergency, only the restoration of breathing takes priority over the control of bleeding.

External bleeding may occur following an injury to the outside of the body, or internally from an injury in which blood escapes into tissue spaces or the body cavity.

External bleeding frequently is divided into arterial, venous, or capillary. However, such a classification is of little value because blood may escape at the same time from all three types of vessels when a wound is large. In capillary bleeding, blood and serum ooze to the surface as in an area of scraped skin. Blood from a vein is dark red in color and has a steady flow. Arterial blood is bright red in color and flows from the wound in spurts. In emergencies, the important consideration is the amount of bleeding and how it can be controlled, not its source.

Internal bleeding may occur as a result of a direct blow to the body, strains, sprains, and from diseases as a bleeding ulcer. When vessels are ruptured, blood leaks into tissue spaces and body cavities. Internal bleeding should be suspected in all cases that involve penetrating or crushing injuries of the chest and abdomen.

The signs and symptoms of excessive loss of blood are weakness or actual fainting; dizziness; pale, moist, and clammy skin; nausea; thirst; fast, weak, and irregular pulse; shortness of breath; dilated pupils; ringing in the ears; restlessness; and apprehension. The patient may lose consciousness and stop breathing. The number of symptoms and their severity is generally proportionate to how fast the blood is lost and the amount.

Once the bleeding has been controlled, the patient should be placed in a reclining position, encouraged to lie quietly, and treated for shock. (See p. III–9.) *Fluids should not be given by mouth when internal injury is suspected.*

Bleeding may be controlled by direct pressure, elevation, and pressure at pressure points. A tourniquet should be applied *only* when every other method fails to control the excessive bleeding.

Direct Pressure

The simplest and preferred method to control severe bleeding is to place a dressing over the wound and apply pressure directly to the bleeding site with the palm of the hand. (See Fig. 3–6.) Although a sterile dressing should be applied, one may not be available at the time

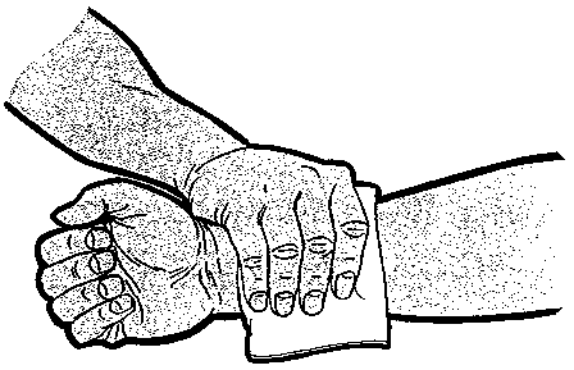


Fig. 3–6. Applying direct pressure to a wound.

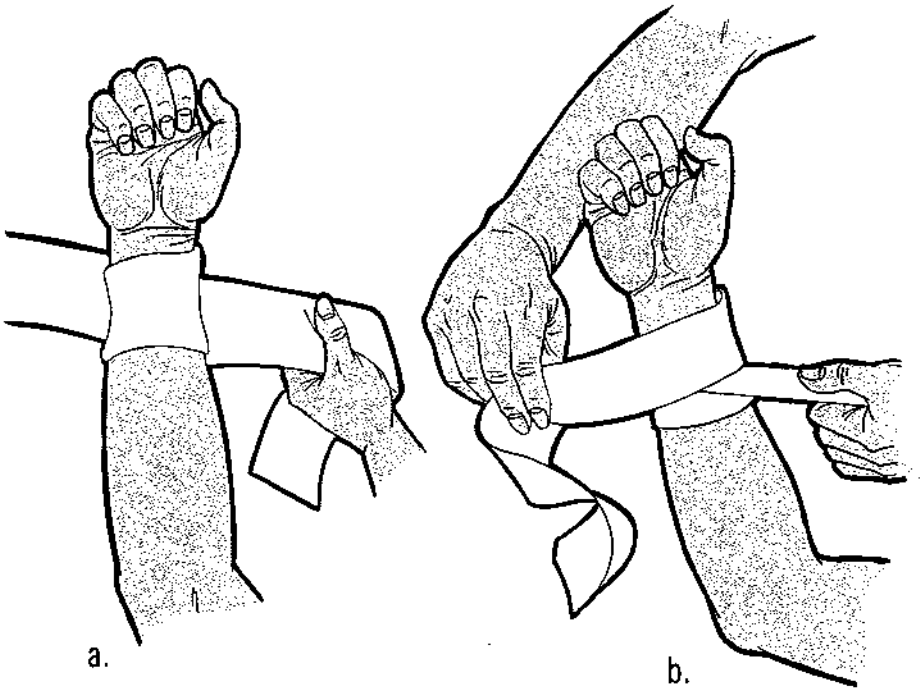


Fig. 3–7. Applying a pressure bandage.

of the emergency; so the cleanest cloth on hand may have to be used. In the absence of a dressing or cloth, the bare hand may be used until a dressing is available. If the dressing becomes soaked with blood, another dressing should be applied over the first one with firmer hand pressure. The initial dressing *never* should be removed because this will disturb the clotting process.

A pressure bandage can be applied over the dressing to hold it in place while additional emergency care is given to the patient. The center of the bandage should be placed directly over the dressing on the wound. A steady pull should be maintained as the ends of the bandage are wrapped around the injured part of the body. (See Fig. 3–7.) Unlike the normal bandaging of wounds or the splinting of fractures, the bandage should be tied over the dressing to provide additional pressure to the bleeding area. Do *not* cut off the circulation. A pulse should be felt on the side of the injured part away from the heart. If the bandage has been applied properly, it should be allowed to remain in place undisturbed at least 24 hours. If the dressings are not soaked with blood and the circulation beyond the pressure dressing is adequate, they need not be changed for several days.

Elevation

When there is a severely bleeding wound of an extremity or the head, direct pressure should be applied on a dressing over the wound with the part elevated. The force of gravity then lowers the blood pressure in the affected part and the flow of blood is lessened.

Pressure Points

When direct pressure and elevation cannot control severe bleeding, pressure should be applied to the artery that supplies the area. Because this technique reduces the circulation to the wounded part below the pressure point site, it should be applied only when absolutely necessary and only until the severe bleeding has lessened. There are a large number of pressure point sites where the fingers may be applied to help control bleeding. (See Fig. 3–8.) However, the brachial artery in the upper arm and femoral artery in the groin are the most effective pressure points.

The pressure point for the brachial artery is located midway between the elbow and the armpit on the inner arm between the large muscles. To apply pressure, one hand should be around the patient's arm with the thumb on the outside of the arm and the fingers on the inside. Pressure is applied by moving the

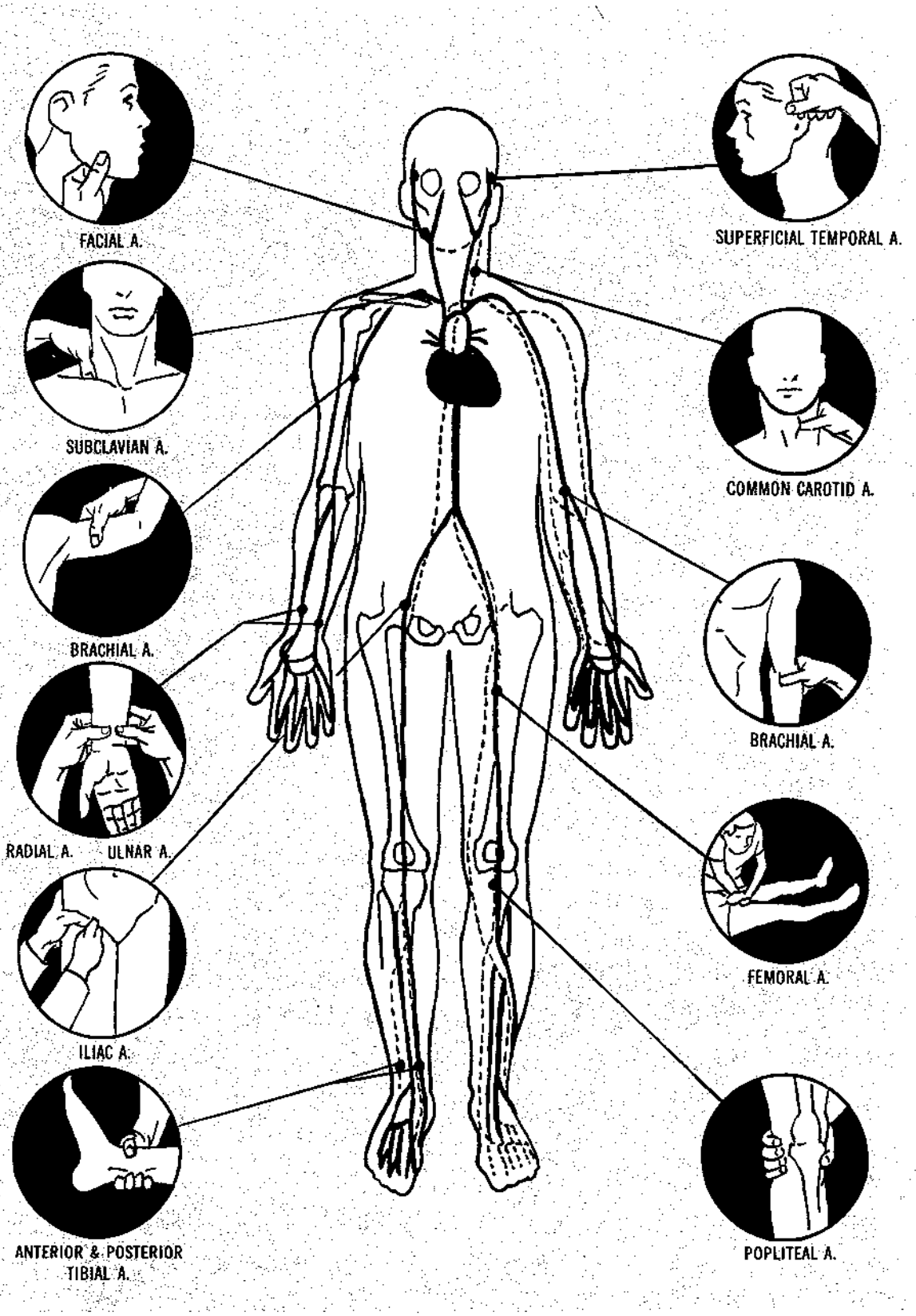


Fig. 3–8. Pressure points (arteries).

flattened fingers and the thumb toward one another. The pressure point for the femoral artery is located on the front of the upper leg just below the middle of the crease of the groin. Before pressure is applied, the patient should be turned on his back. Pressure should be applied with the heel of the hand while keeping a straightened arm.

Tourniquet

A tourniquet should be applied to control bleeding *only* when all other means have failed. Unlike direct hand pressure, a tourniquet shuts off all normal blood circulation beyond the application site. Damage to the tissues from a lack of oxygen and blood may result in limb destruction or amputation. Releasing the tourniquet periodically will result in loss of blood and danger of shock. If the tourniquet is too tight or too narrow, it will damage the muscles, nerves, and blood vessels; if too loose, it may increase blood loss. Also, tourniquets have been applied and forgotten. *If a tourniquet is applied to save a life, immediate medical advice by radio must be obtained.*

A tourniquet must be improvised from a *wide* band of cloth or one prepared commercially may be used. An improvised tourniquet may be made from folded triangular bandages, clothing, or similar material. The clothing or bandage should be folded approximately two inches wide and long enough to encircle the limb at least twice. To apply a tourniquet:

- Place the tourniquet slightly above the wound, fold the material around the limb twice, and tie a simple knot. (See Fig. 3–9a.)
- Place a piece of wood or similar material approximately six inches long over the knot and secure it in place with a square knot. (See Fig. 3–9b.)
- Twist the piece of wood several times to exert enough pressure to stop the bleeding. (See Fig. 3–9c.)
- Secure the piece of wood in place with the free ends of the tourniquet if they are long enough. (See Fig. 3–9d.) If not, use another bandage to hold the wood in place. (See Fig. 3–9e.)
- Attach a sheet of paper to the patient's clothing or extremity, giving the location of the tourniquet and the time that it was applied.

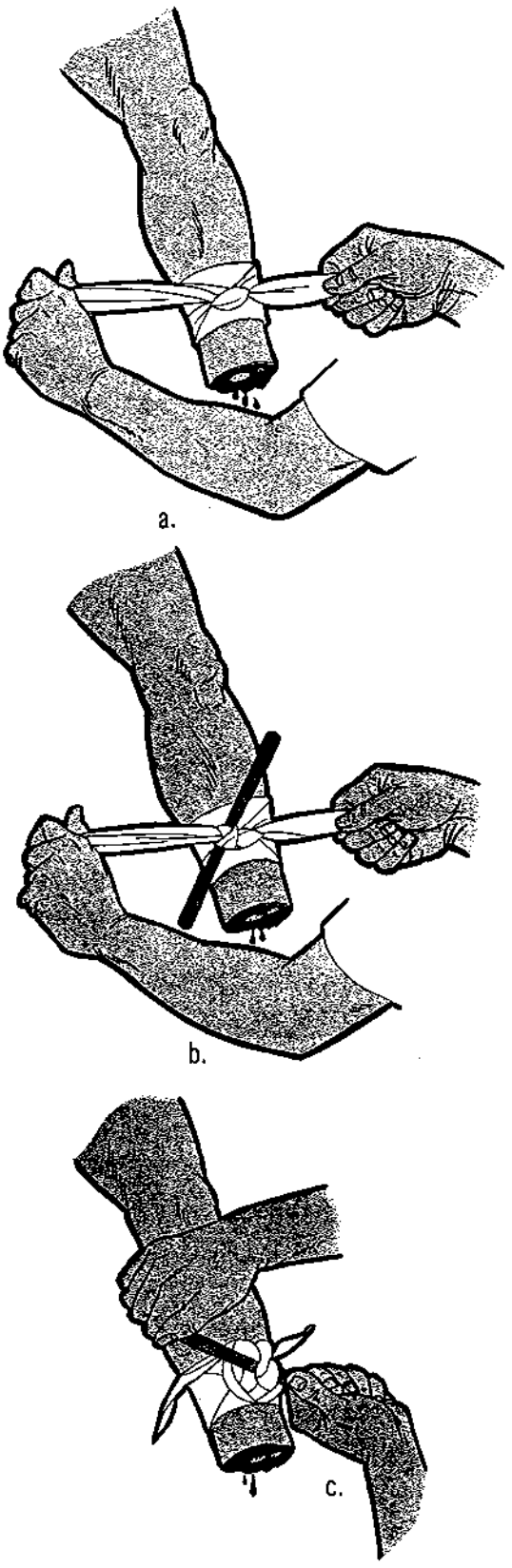
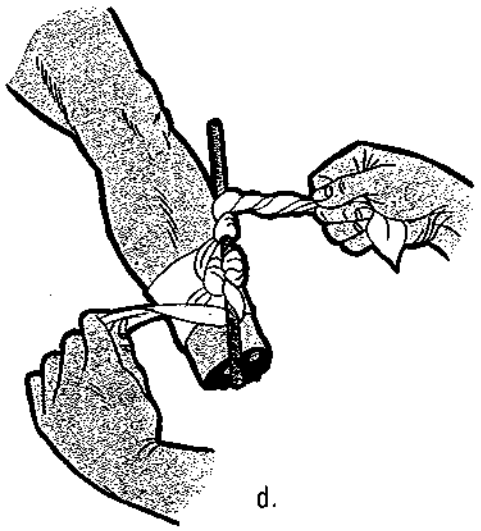


Fig. 3–9. Applying a tourniquet.



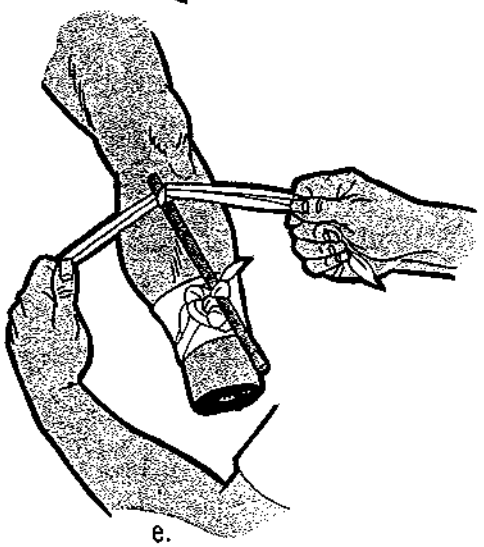


Fig. 3–9. (Continued).. Applying a tourniquet.

• *Never* cover the tourniquet with clothing, bandages, or hide it in any way.

• *Never* loosen the tourniquet, unless a physician advises it.

SHOCK

Shock following an injury is the result of a decrease in the vital functions of the various organs of the body. These functions are depressed because of inadequate circulation of blood or an oxygen deficiency. Injury-related (traumatic) shock differs from other forms, as insulin shock and electric shock, which are discussed in other sections of this book.

Shock usually follows severe injuries as extensive burns, major crushing injuries particularly of the chest and abdomen, fractures of large bones, and other extensive or extremely painful injuries. Shock follows the loss of large quantities of blood; allergic reactions; poisoning from drugs, gases, and other chemicals; alcohol intoxication and the rupture of a stomach ulcer. It also may be associated with many severe illnesses as infections, strokes, and heart attacks.

In some individuals the emotional response to trivial injuries or even to the mere sight of blood is so great that the person feels weak, nauseated, and may faint. This reaction may be considered to be an extremely mild form of shock which is not serious and will disappear quickly if the patient lies down. The signs and symptoms of the more severe degrees of shock are quite similar to those of the extremely mild form. Severe shock, however, tends to become progressively worse, does not respond readily to treatment, and seriously threatens the life of the patient.

Signs and Symptoms of Shock are:

Paleness. The skin is pale, cold, and often moist. Later it may develop a bluish, ashen color. When the patient has dark skin, the color of mucous membranes and nail beds should be examined.

Rapid and shallow respirations. The breathing possibly could be irregular and deep.

Thirst, nausea, and vomiting. These frequently occur in a hemorrhaging patient in shock.

Weak and rapid pulse. Usually the pulse rate is over 100.

Restlessness, excitement, and anxiety. These occur early, later change to mental dullness, and still later to unconsciousness. In this late stage the pupils are dilated, giving the patient a vacant, glassy stare.

Although symptoms of shock may not be evident, all seriously injured persons should be treated for it to prevent its possible development.

Treatment for Shock:

• ***Eliminate the causes of shock.*** This includes control of bleeding, restoration of breathing, and relief of severe pain.

• ***Have the injured person lie down.*** The patient should be placed in a horizontal position and covered with a blanket only heavy enough to maintain normal body temperature. However, when there is a neck or back injury, the patient should *not* be moved until he is prepared for safe transportation. Further injury must be prevented. A patient with a head injury should be positioned with the head at the same level or higher than the body. An unconscious person or one with facial injuries should be placed on the side to allow for the drainage of fluids from mouth and nose.

The patient's legs may be elevated approximately 12 inches to assist the flow of blood to the heart and head. The legs should not be elevated if there is a head or chest injury, or difficulty in breathing.

• ***Keep the patient warm, but not hot.*** Too much heat raises the surface temperature of the body and causes the blood supply to leave vital organs and move to the skin.

• ***Relieve pain as quickly as possible.*** If pain is severe, morphine sulfate 10 mg may be given by intramuscular injection. If the blood pressure is low, morphine sulfate should *not* be given because it may cause an additional drop in the pressure. Also, it should not be given to injured patients without severe pain. The dosage should be repeated only after medical advice by radio.

• ***Administer fluids.*** Liquids should not be given by mouth if the patient is unconscious, drowsy, convulsing, or about to have surgery or an anesthetic. Also, fluids should *not* be given if there is a puncture or crush wound to the abdomen or a brain injury. If none of the above conditions is present, lukewarm water containing one teaspoonful of salt and a half teaspoonful of baking soda to each quart of water should be given. One-half glass may be given to an adult every 15 minutes, two ounces to children, and one ounce to infants under a year. Alcohol *never* should be given.

The intravenous administration of fluids is preferable in the treatment of shock if a person trained to administer them is available. (See p. VII–12.) Lactated Ringer's Injection may be started intravenously.

Medical advice should be obtained by radio.

TREATMENT OF WOUNDS

Removal of Foreign Matter

Wood splinters, glass, wood and metal fragments, clothing threads, dirt, and other foreign matter that remain in a wound should be removed if they are near the surface and visible. Such materials in a wound may not cause discomfort to the patient but may result in bacterial infection if allowed to remain. However, deeply embedded material should *not* be removed for fear of causing additional damage.

A sterile forceps and hemostat may be used to remove foreign matter; also, irrigation of the wound with sterile water is helpful. The tip of a sterile needle can be used to remove small particles of matter.

Large Objects

Large penetrating objects *never* should be removed from the body. Also, the body should not be removed from a fixed object, as a ground stake. Medical advice and assistance needed to remove the object should be obtained immediately. Any movement of an impaled object should be prevented. If it cannot be broken off close to the body, dressings should be placed around the object to immobilize it. Doughnut-shaped dressings are most effective because they fit securely around the object and are less likely to come undone. The dressings should not be added until the object's position is stabilized. Then, a dressing should be placed over the area and a bandage applied to hold the object securely in place. Plans should be made to evacuate the patient to the nearest medical facility as soon as possible.

Fishhooks

A fishhook can be removed easily when only the point and not the barb penetrates the skin. If the barb of the hook enters the skin, it must be pushed until it has penetrated through the skin on the opposite side. Then, the barb should be cut off with a wire cutting instrument and the rest of the hook removed. (See Fig. 3–10.) After the wound has been cleansed, a bandage should be applied. The wound should be observed for any signs of infection and tetanus toxoid given if required. (See p. VI–46.)

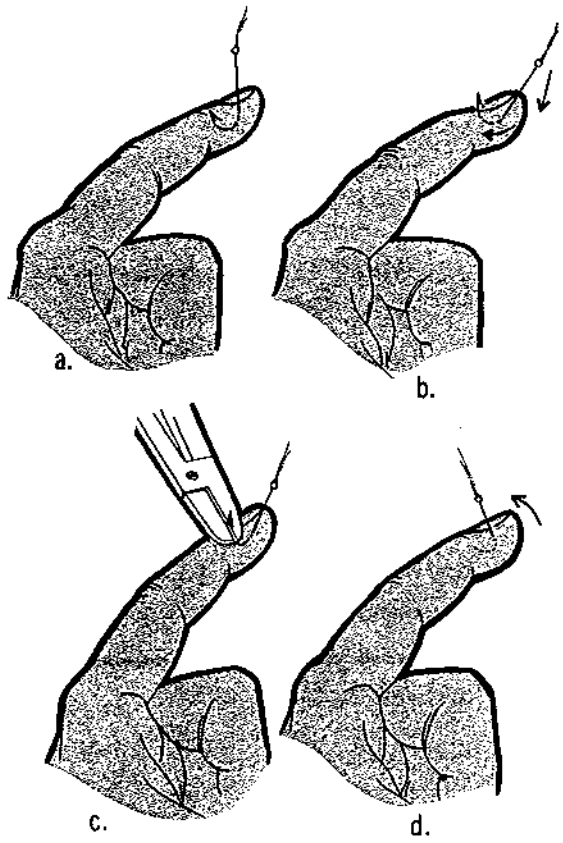


Fig. 3–10. Removing a fishhook from a finger.

Cleansing the Wound

Appropriate measures should be taken to prevent or reduce the chance of a wound infection. However, when a bandage has been applied to control severe bleeding, it *never* should be removed to cleanse a wound because additional bleeding may occur.

Before cleansing any wound, the attendant should wash both hands thoroughly with soap and water. If the wound involves tissue other than skin, it is advisable to put on sterile rubber gloves before proceeding with the treatment.

When the wound involves only the skin and no deeper tissues, it should be washed thoroughly with clean water and blotted dry with a sterile dressing. Povidone-iodine solution may be applied to the wound area. A sterile dressing should be applied over the wound and bandaged securely in place. (See Bandaging, p. III–14.)

If wounds of the skin and deeper tissues are not bleeding excessively and are not bandaged to control bleeding, they should be rinsed thoroughly with sterile saline solution. Then, the wound should be blotted dry with a sterile dressing. A sterile dressing should be placed over the site and bandaged securely in place. (See Bandaging, p. III–14.)

If the patient is in severe pain, morphine sulfate 10 mg may be given by intramuscular injection and may be repeated every 4 hours upon medical advice by radio. If the wound is severe, medical advice by radio should be obtained and plans made to transfer the patient to the nearest medical facility.

Blood Blisters (Hematomas)

Blood blisters that occur under fingernails and toenails as a result of a blow are very painful. If a hole is made in the nail to allow the blood to escape, the patient will obtain some relief.

Treatment

The patient's hand should be cleansed with soap and water, and povidone-iodine solution applied. The head of a straight pin should be heated until it glows—then carefully pressed through the nail into the center of the blood blister. If this is done carefully, a tiny opening will be made in the nail, and the hot pin will not penetrate into underlying tissues. The hole releases pressure, drains the blood blister, and gives the patient prompt relief from pain. A sterile dressing should be applied over the area.

Animal Bites

Open wounds as abrasions, lacerations, and punctures may be caused by animal bites. Not only is there a danger of bacterial infection including tetanus from these wounds, but rabies also is a threat. (See Rabies, p. V–51.)

Insect Bites and Stings

The bite or sting of an insect produces an open wound in the skin. The venom which is injected under the patient's skin generally causes local discomfort with some swelling, itching, and redness. Allergic reactions will vary in different individuals from a minor condition to anaphylactic shock. A person extremely sensitive to the venom may not live an hour unless treatment is given immediately.

Anyone who receives a bite or sting should be observed for one or two hours for a possible reaction.

Treatment

The stinger should be removed with a forceps if it is still in place. Venom will continue to be released slowly from the stinger of a bee if left in the skin. When there are minor allergic reactions, the wound should be cleansed with soap and water, and cold applications used to reduce the swelling. If the patient is uncomfortable, diphenhydramine hydrochloride 25 mg may be given by mouth every 6 hours until the reaction subsides.

If an anaphylactic reaction occurs, 0.5 ml epinephrine 1:1,000 should be given subcutaneously. After normal breathing is restored, the patient should be kept under observation for several hours. Medical advice by radio should be obtained for additional treatment of insect bites.

Spider Bites

The *black widow spider*, identified by the red hourglass design on its bottom surface, injects a powerful venom through two puncture sites. A severe cramping muscular pain spreads within an hour to the chest, abdomen, back and leg muscles. The patient may have a headache, difficulty in speaking, and may be perspiring and restless.

Treatment

Treatment should be calcium gluconate 10% injected intravenously slowly *only* until the muscular cramps are relieved. Then, medical advice should be obtained by radio for additional treatment. The wound should be washed with soap and water, and povidone-iodine solution and a dressing applied. Adults usually recover from the bite of a black widow spider in about three days.

Tarantula bites may cause severe local reactions. Usually they do not cause generalized reactions, but they can be fatal. The wound should be cleansed as directed for bites by the black widow spider. Medical advice by radio should be obtained, especially on whether calcium gluconate may be administered.

Snakebites

The severity of local and generalized reactions to a snakebite will vary in relation to the kind and size of the snake, the amount of venom it is carrying, and the location of the bite. Venom from some snakes is more toxic than others, and some inject more venom. If some venom was discharged in a recent strike, the remaining amount will produce a milder reaction.

The location of the bite will influence the reaction. Venom in a muscle is absorbed faster than in subcutaneous tissue. A healthy adult will have a milder reaction than a child. The amount of time it takes before antivenin therapy can be started influences the severity of the reaction. Clothing such as gloves and shoes may have provided some protection.

Venom from *pit vipers such as rattlesnakes and water moccasins* affects the victim's circulatory system. The skin is discolored due to destruction of red blood cells and interference with clotting. There is pain at the site, swelling, at least one fang mark, a rapid pulse, and general weakness. The swelling tends to progress and the entire extremity may be swollen if the victim does not receive treatment for a period of time after the bite. Nausea, vomiting, breathing difficulty, and shock may occur gradually over one to two hours.

Venom from a *coral snake* affects the nervous system of the victim. Usually only a slight burning pain and slight swelling may be present at the bite. However, slurred speech, blurred vision, drowsiness, drooping eyelids, sweating, and increased salivation occur. Additional symptoms might include breathing difficulty, nausea, vomiting, convulsions, paralysis, and coma.

Symptoms from the bite of a *cobra* are similar to that of a coral snake. However, there is more intense local pain and tissue may die (undergo necrosis) at the site of the wound.

Treatment

For snakebite aim to maintain breathing, reduce the spread and absorption of the venom, and protect the wound from additional injury. The following should be done:

- Immobilize the affected extremity.

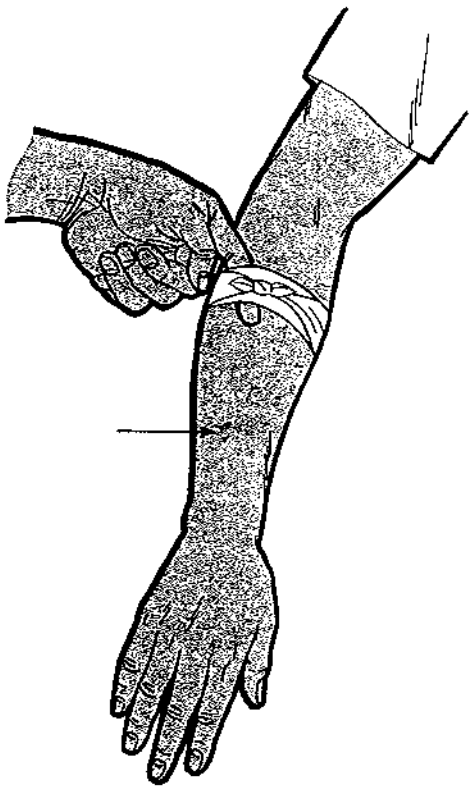


Fig. 3–11. Applying a constricting band for a snakebite.

• Apply a constricting band about two to four inches above the bite between the heart and the wound. (See Fig. 3–11.) The band should be tight enough to decrease the flow of blood in the superficial veins and lymphatic return. It should be released for 90 seconds every 15 minutes and reapplied above the advancing swelling.

• Make an incision through or near each fang mark with the blade from a snakebite kit or with one sterilized over a flame. The incision should only be one-eighth to one-fourth of an inch long and should extend only through the full thickness of the skin. If incisions are deeper, muscles and nerves might be injured.

• Apply intermittent suction to the cuts with the suction cup in the snakebite kit or with the mouth. The poison should be rinsed from the mouth, although it is not poisonous in the stomach. The poison could be dangerous to anyone with cuts, wounds, or bleeding gums in the mouth. The suction should be continued for the first hour. Suction applied after the first 30 minutes is of little value.

• Cleanse the wound with soap and water, dry, and apply a sterile dressing.

• Apply ice wrapped in waterproof material to the wound to slow down the spread of the venom.

• Treat for shock. (See p. III–9+.)

• The victim may be given sips of fluid, unless nauseous or unconscious. Do *not* give alcohol. The resulting dilation of the superficial blood vessels will increase the absorption of the venom.

• Give antivenin serum for the specific type of snakebite, if known. The directions on the package should be followed when administering it. If antivenin is not available, an attempt should be made to obtain it or to transport the victim to the nearest medical facility as soon as possible.

• Obtain medical advice by radio for additional treatment, including antibiotic therapy and prevention of tetanus.

The patient should be kept quietly in bed and observed for at least two days following a snakebite. If death should occur, it usually will happen during the first two days.

Human Bites

A severe infection may develop in a wound caused by human teeth because the mouth abounds with potentially harmful bacteria. However, self-inflicted bites of the tongue and lip are tolerated well.

The bite should be treated the same as other wounds (see p. III–10+) and observed carefully for any infection. Treatment for tetanus is not needed because the causative organism is not found in the human mouth.

INFECTION

All open wounds contain bacteria. The potential for an infection to develop is dependent upon the type and quantity of bacteria present, the adequacy of the blood supply to the area, and the amount of damaged tissue within the wound. Normal body tissues are capable of destroying large numbers of some bacteria. However, other bacteria resist destruction by the body's defense mechanisms. Careful cleans-

ing of a wound and removal of foreign matter will help to prevent an infection.

Wound infections usually do not become evident until some time after the injury. During the first two or three days there may be throbbing pain, swelling, redness, and excessive warmth in the area of the wound. These are symptoms of infection; also they occur following most extensive injuries. The symptoms tend to diminish toward the end of the first 48 hours if the wound is healing satisfactorily. However, if the symptoms increase, infection may have set in. As an infection progresses, the patient will develop a rising temperature and pulse rate. Pus may develop beneath the skin or drain from an open wound. The size of the inflamed area will increase as surrounding tissues become involved. Red streaks that radiate upward from the infected area indicate the spread of infection through the lymphatic circulation. Swollen lymph glands may appear as tender nodes in the groins, armpits, or neck; this indicates that the infection has spread beyond the immediate site of the injury. A systemic infection of this type is very serious and medical advice from a physician should be obtained by radio.

Treatment

The patient should be placed in bed with the infected body part elevated, if possible. This will reduce swelling and pain. To improve the circulation warm, moist packs (see p. VII–21) should be applied to the wound four times daily for periods of 30 minutes. Daily redressing of the wound is necessary to remove the infected discharge from the surface of the wound.

BANDAGING

Butterfly

A butterfly strip may be applied to hold together the gapping edges of a small wound. (See Fig. 3–12.) When commercially-produced butterfly strips are not available, they can be improvised from adhesive tape. If a dressing is needed, it may be applied directly over the strips. A splint or sling may be applied to prevent reopening a wound when it is near a joint, or an area where movement might separate the edges.

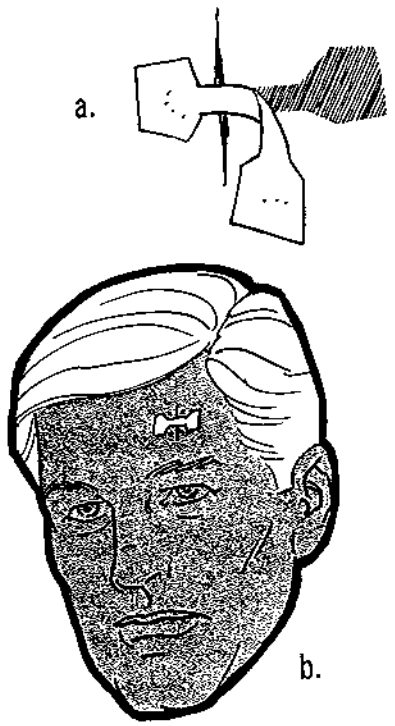


Fig. 3–12. Applying a butterfly strip.

Roller Bandage

A roller bandage is applied to hold a dressing securely in place over a wound. For this reason, it should be applied snugly, but not tightly enough to interfere with the circulation. Fingers and toes should be checked periodically for coldness, swelling, blueness, and numbness. If any of these symptoms occur, the bandage should be loosened immediately.

Anchoring a Roller Bandage

- Hold the roll of bandage in the right hand with the loose end on the bottom. The left hand may be used if left-handed.
- Place the outside surface of the loose end at an angle on the body part. (See Fig. 3–13a.)
- Roll the bandage around in a direction away from the body part.
- Bring the bandage from under to over the body part, and turn down the uncovered triangle on the end. (See Fig. 3–13b.)
- Roll the bandage over the end two more times to anchor it and begin circling the body part. (See Fig. 3–13c.)

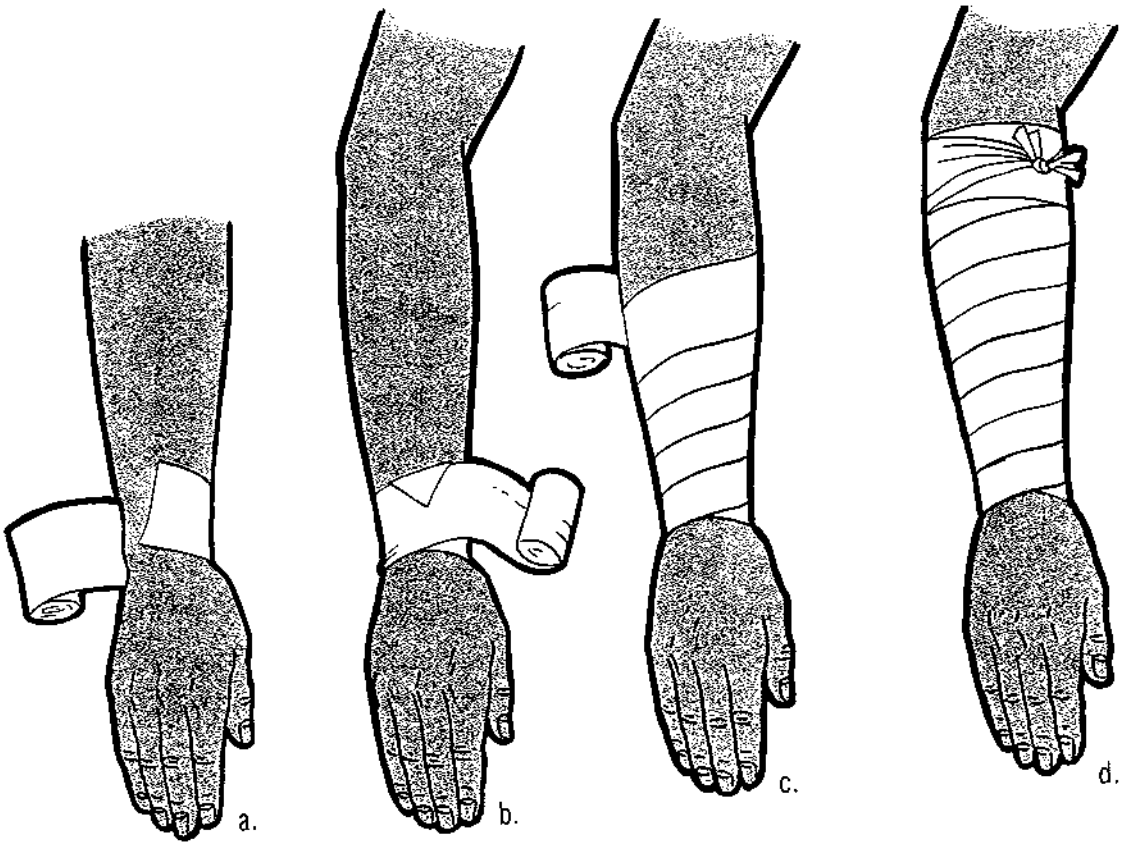


Fig. 3–13. Applying a roller bandage.

Applying a Roller Bandage

• Continue to circle the body part with the bandage using spiral turns. (See Fig. 3–13d.)

• Space the turns so they overlap and completely cover the skin.

Fastening a Roller Bandage

Roller bandages may be fastened with such items as clips, safety pins, or tape. Two methods of fastening them by tying are:

Method 1

• Fold the bandage back upon itself. (See Fig. 3–14.)

• Pass the loose end through the loop formed by folding the bandage backward and tie.

Method 2

• Split the end of the bandage lengthwise for approximately 12 inches and tie a knot to prevent further splitting. (See Fig. 3–15.)

• Pass the ends in opposite directions around the body part and tie.

Chest or Back Bandage

A triangular bandage may be used to secure large dressings on wounds and burns.

• Place the point of the bandage over the shoulder. Let the rest of the bandage drop down over the chest or back with the middle of the base under the point. (See Fig. 3–16a.)

• Fold the base of the bandage up far enough to secure the dressing and tie the ends in the back below the shoulder blade. One long and one short end will be left. (See Fig. 3–16b.)

• Bring the long end up to the shoulder and tie it to the point of the triangle. (See Fig. 3–16c.)

Chest or Abdomen Bandage

This bandage may be used to secure large, bulky dressings in place on the abdomen or chest. It may be improvised from a piece of cloth, a bedsheet, or large bath towel. The bandage should be placed under the patient and pinned securely in the front. (See Fig. 3–17.)

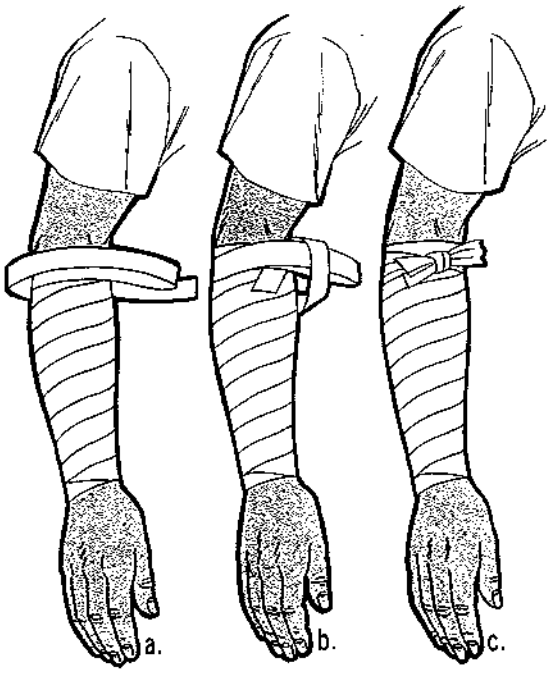


Fig. 3–14. Fastening a roller bandage, method 1.

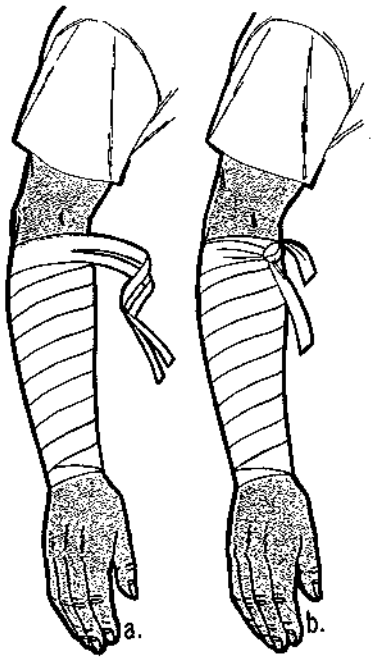


Fig. 3–15. Fastening a roller bandage, method 2.

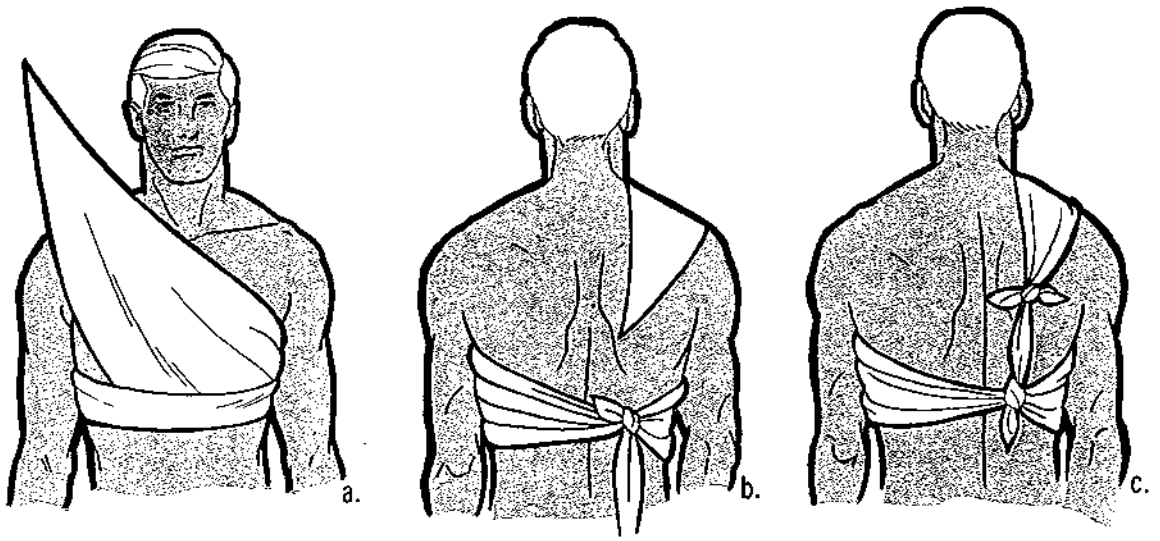


Fig. 3–16. Bandage for chest or back.

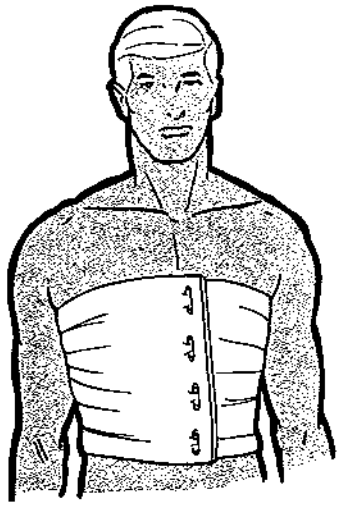


Fig. 3–17. Bandage for chest or abdomen.

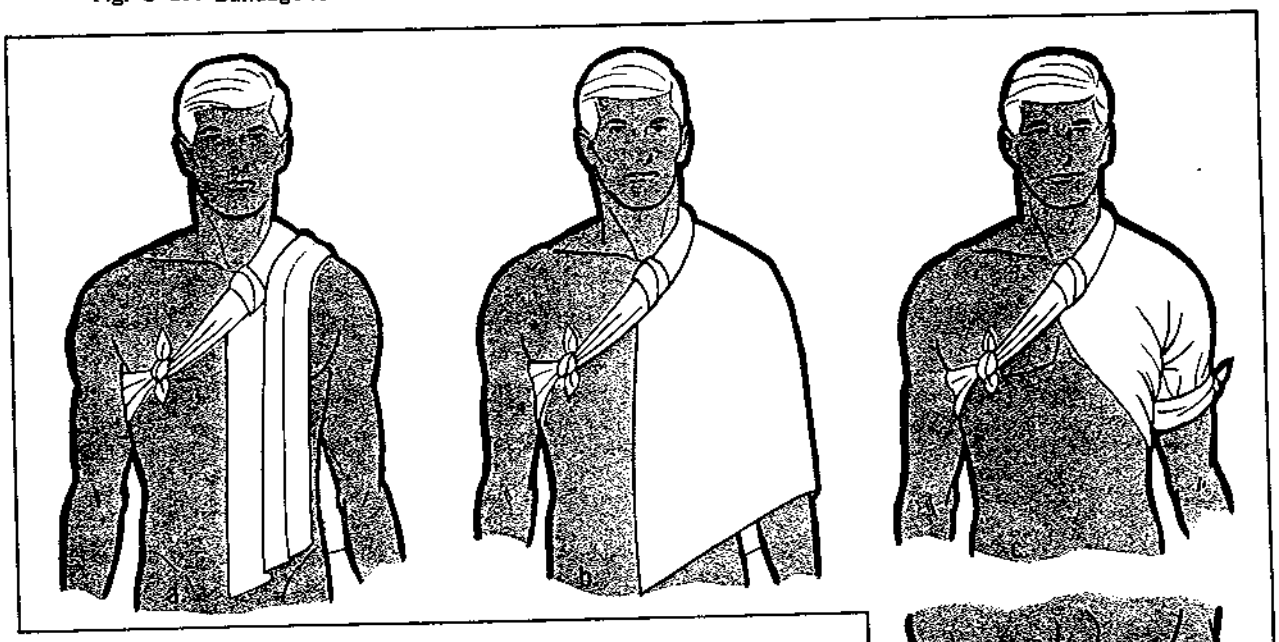
angular bandage and place it on top of the cravat. (See Fig. 3–18.)

• Place the center of the cravat over the injured shoulder. Bring the back end of the cravat under the opposite armpit and tie slightly in front of it.

• Bring the base of the folded triangular bandage down and over the dressing on the shoulder.

• Fold up the base of the triangular bandage. Wrap the ends around the arm and tie in front.

• A view of the bandage applied to the hip is shown in Fig. 3–18d.



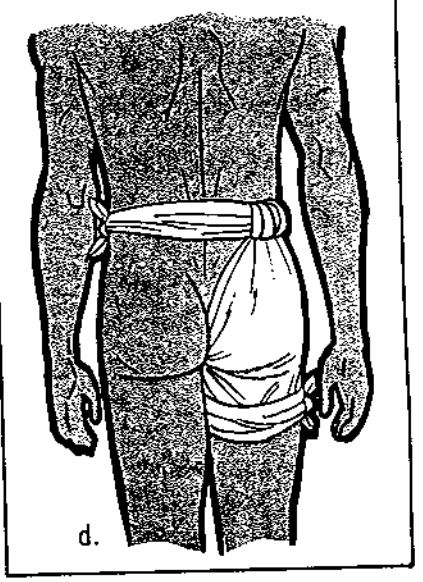


Fig. 3–18. Bandage for shoulder or hip.

Shoulder or Hip Bandage

This bandage is used to secure a dressing in place over a wound or burn on the shoulder or hip. A triangular bandage and a cravat bandage together should be used. The cravat bandage may be made by folding a triangular bandage into a narrow band; or it may be improvised from such items as a roller bandage, tie, or belt.

• Place the cravat bandage on the point of the triangular bandage and roll them together several times. Fold the remainder of the tri-

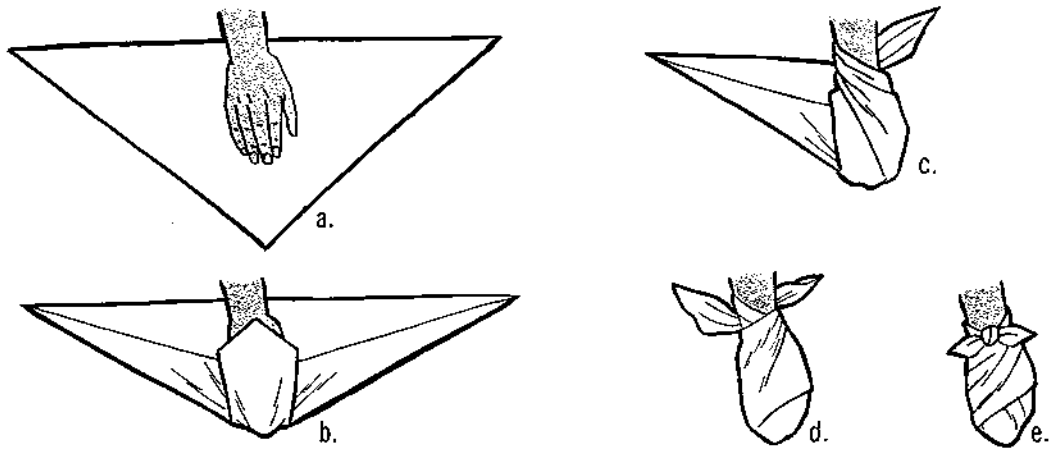


Fig. 3–19. Bandage for hand or foot.

Hand or Foot Bandage

One triangular bandage may be used to secure large dressings in place on the hand or foot.

- Place the wrist or heel in the center of a triangular bandage with the finger or toes pointing toward the point. (See Fig. 3–19a.)
- Fold the point of the bandage up and over the fingers or toes. (See Fig. 3–19b.)
- Wrap the ends of the bandage across the hand or foot to the opposite side and around the wrist or ankle. (See Fig. 3–19c and d.)
- Bring the ends of the bandage to the front of the wrist or ankle and tie. (See Fig. 3–19e.)

- **Classification**
  - First-Degree
  - Second-Degree
  - Third-Degree
- **Extent of the Burn**
- **Treatment**
  - First-Degree
  - Second-Degree
  - First- and Second-Degree
  - Second- and Third-Degree
- **Respiratory Burns**
- **Electrical Burns**
- **Chemical Burns**

Chapter III

Emergency Treatment of Injuries

Section C
BURNS

SOME BURNS CAN BE VERY SEVERE, painful injuries that require many months of costly care. They are a leading cause of accidental death in the United States. These injuries are caused by heat, electricity, chemicals, and radiation.

Burns caused by excessive heat are called thermal burns. Injuries from moist heat result from contact with such things as steam and hot liquids. Injuries from dry heat result from contact with such things as lighted cigarettes, open fires, hot metal, and explosions. Faulty wiring often is the cause of electrical burns. The improper use of chemicals such as lye, strong cleaning products, and acids also may result in burns. Radiation burns result from X-rays, radioactive substances, or ultraviolet rays.

CLASSIFICATION

Burns may be classified by depth which may vary in severity in different areas of the body. Depth is spoken of in "degrees."

First-Degree Burns

Normal skin is made up of two main layers: the outer epidermis and the dermis. (See Figs. 3–20 & 1–2.) The dermis is a deep inner layer that has sweat glands and hair follicles which are important in the regrowth of skin in first-degree and second-degree burns.

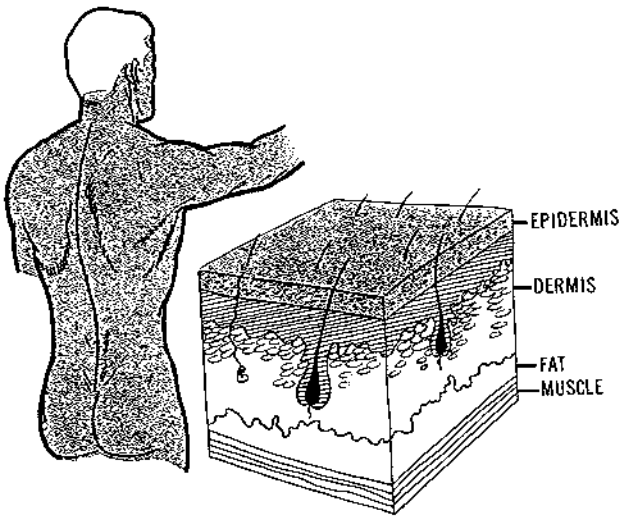


Fig. 3–20. Normal skin.

First-degree burns affect only the outer epidermal area and are characterized by redness, mild swelling, increased warmth, tenderness,

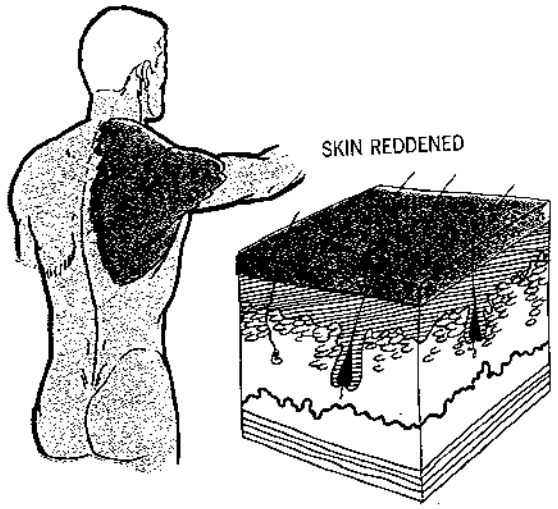


Fig. 3–21. First-degree burn.

and pain. (See Fig. 3–21.) These burns often are the result of sunburn, scalding by hot water or steam, and sudden flash burns. Although quite painful at first, first-degree burns usually heal without scarring within a week.

Second-Degree Burns

Second-degree burns involve the entire layer of the epidermis and extend into the under layer of the skin (dermis). (See Fig. 3–22.) Superficial second-degree burns are characterized by deep reddening, blister formation, considerable swelling, and weeping of fluid. Deep second-degree burns may not be distinguishable from third-degree burns immediately after the injury. There is severe pain because of the irritated and overly sensitive nerve endings; and any breeze, pressure, or disturbance to the area will cause increased pain. These burns often are the result of a very deep sunburn, contact with scalding liquid, and flash burns from such things as gasoline and kerosene. If the burns do not become infected, they should heal with little scarring in about three weeks. If infection does occur, the burn may transform into a third-degree type injury.

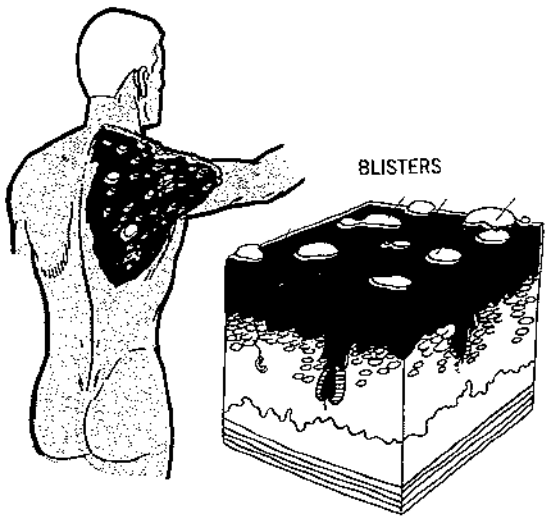


Fig. 3–22. Second-degree burn.

Third-Degree Burns

Third-degree burns involve the epidermis, dermis, and may extend to the underlying fat, muscle, and bone. (See Fig. 3–23.) They usually are characterized by charring of the skin which may be black or dark brown, hard, cherry red and dry, milk white, thick, and leathery. Coagulated blood vessels frequently may be identified. Pain may be absent due to the destruction of the nerve endings. These burns may be the result of hot liquids, ignited clothing, explosions, electricity, and gasoline or oil fires. This type of burn will not heal properly by itself, except at the margins of the wound. Early skin grafting must be done to prevent contractures which may occur as scar tissue covers the damaged area.

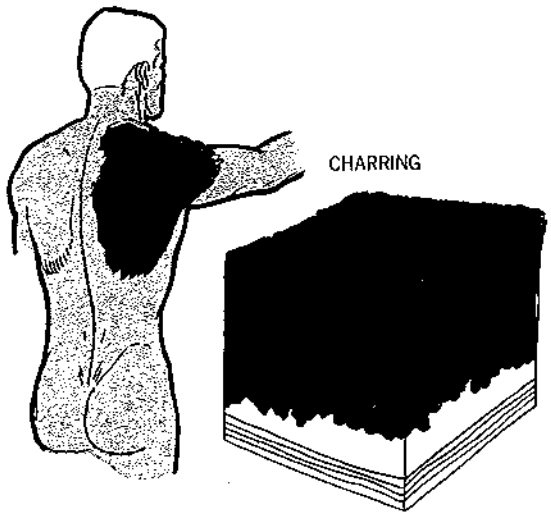


Fig. 3–23. Third-degree burn.

EXTENT OF THE BURN

The amount of burned skin surface in an *adult* can be estimated by using the *rule of nines.* (See Fig. 3–24.) The head and neck represent 9% of the body surface, each arm 9%, the chest 9%, the upper back 9%, the abdomen 9%, the buttocks and lower back 9%, the front of each leg 9%, the back of each leg 9%, and the perineum and genitalia 1%. In *children,* the head is larger in relationship to the body and should be counted as 18%; otherwise, the basic rule may be used. The *rule of eights* is used to estimate the burned surface in *newborns.* Because the head and upper extremities are larger in relationship to the body, the head alone will represent 16% of the body surface, the neck 4%, each arm 16%, front of the body 16%, back of body 16%, and each leg 8%.

Generally, an adult with second-degree burns of 15% or more of the body surface, and children with second-degree burns of 10% or more of the body surface may require hospitalization. Critical burns require immediate examination and hospitalization because of their life-threatening nature.

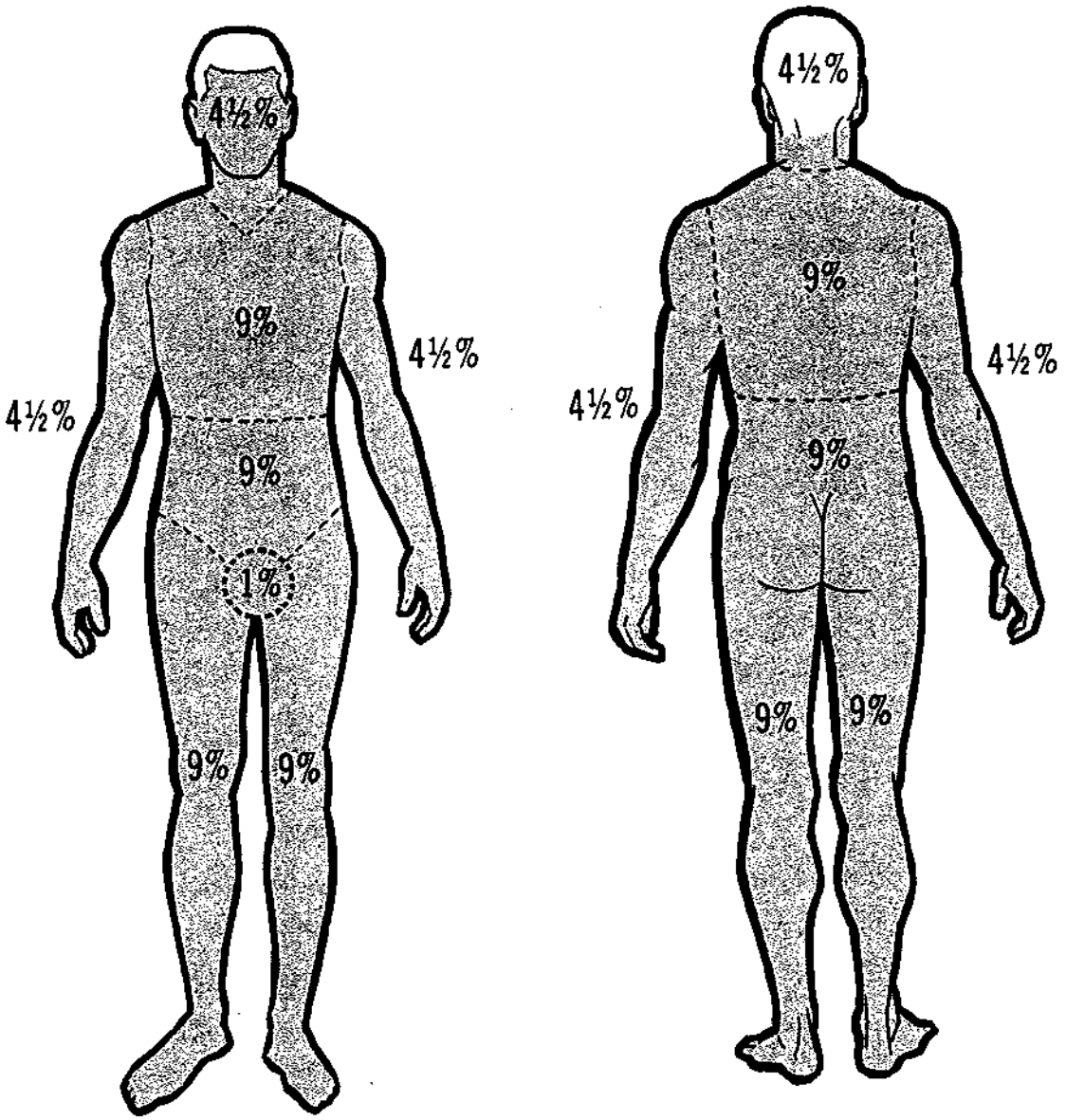


Fig. 3–24. Rule of nines to determine extent of burns.

Burns that involve the respiratory tract are considered critical because breathing may become obstructed as the swelling increases. Respiratory burns can be suspected if the patient has obvious burn injury to the face and neck. This may be identified by singed eyebrows, eyelashes, or hair. More insidious is the respiratory burn suffered by the patient caught in a closed room who inhales superheated gases and carbonaceous particles. This type of respiratory burn may be identified by hoarseness, increased respiratory rate, and carbonaceous particles in patient's sputum. (See p. III–25.) Other critical burns would include third-degree burns of 10% and second-degree burns of 30% or more of the body surface; burns of the face, hands, feet, and perineum; and burns associated with soft tissue injuries and fractures.

The prognosis is poor for patients with third-degree burns that cover 50% or more of the body surface. However, the rate of recovery has increased for patients treated in modern burn centers where newer methods of treatment are used. The age and health of the patient are determining factors in the survival rate. Although a young adult may recover, the very young and elderly may not recover from burns of the same extent and degree. Patients under four and over 40 years of age should be considered more critical when burned.

TREATMENT

First-Degree

First-degree burns that involve only a small area usually require little treatment. To relieve the pain, cold water applications can be applied, or the burned area can be submerged in cold water. Unclean areas should be cleansed with soap and water and left open to air; or if desired, covered with a clean dry dressing. If sunburned areas are clean, they should not be washed.

Second-Degree (Small)

To relieve pain and reduce blister formation, cold water applications should be applied or the burned area of the skin should be immersed immediately in cold water from 1 to 2 hours. Salt lowers the temperature of ice water and *never* should be added as it may cause further injury. Following the cold treatment, the area should be cleansed with soap and water and blotted dry with either sterile gauze or a clean towel.

- Do *not* break the blisters.
- Apply sulfadiazine silver cream, 1% to the burned area and wrap with sterile dressing. Remove the sterile dressing daily and reapply the medication and a new sterile dressing.
- Do *not* try to remove pieces of body tissue that adhere to the wound.

The dressing may be changed more frequently if it develops an odor or becomes soaked with exudate. When the dressing needs to be replaced, it *never* should be pulled from adhering surfaces; the area should be soaked with large amounts of water to free the material from the wound. Before a new dressing is applied, the burned area should be washed gently with soap and water and sulfadiazine silver cream, 1% applied.

First- and Second-Degree (More Extensive)

First-and second-degree burns may require hospitalization when they cover 15% or more of the body surface of an adult. Burns which involve the hands, face, feet, and perineum should be considered serious. Plans should be made as soon as possible to evacuate these patients to the nearest medical facility.

Major Burns—Second- and Third-Degree Burns

(On More than 30% of the Body Surface of Adults and Children)

Treatment for severe burns:

Establish an Airway

The patient should be checked immediately for breathing, and an open airway established. Artificial ventilation or cardiopulmonary resuscitation should be performed, as required (see p. IV–1+).

Respiratory problems always should be anticipated if there are burns around the face, head, and neck; or if during a fire the patient was caught in an enclosed area. Oxygen should be administered to *all* major burn victims with breathing difficulties, because injury to the respiratory tract may have been caused by the

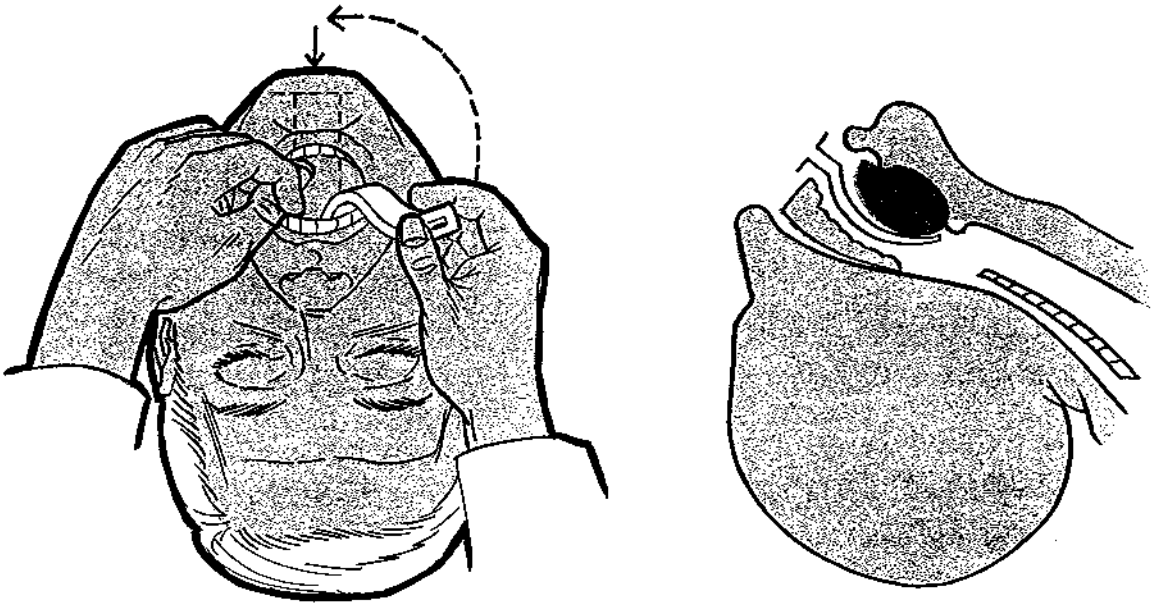
inhalation of smoke or other products of incomplete combustion. Carbon monoxide poisoning also may accompany the burn. These problems may not be evident at the time of the burn but will occur later as the membranes swell due to inflammation.

The tongue of an unconscious patient may drop back into the throat and block the air passage. Usually resuscitation can be accomplished with proper positioning of the head and neck; however, in certain instances an oropharyngeal airway may be required. An oropharyngeal airway is a curved breathing tube which, when inserted into the patient's mouth, holds the base of the tongue forward so it does not block the air passage.

An untrained person should not attempt to insert an airway because of the possibility of damaging the soft tissues and mucous membranes in the victim's throat. Two basic guidelines should be followed to determine whether or not an airway is to be used: (1) when the patient is conscious and breathing normally, no attempt should be made to insert an airway because it will cause him to vomit; (2) when the patient is found to be unconscious with breathing obstructed, an airway should be inserted if breathing remains obstructed in spite of head tilt and attempts at artificial ventilation. If the patient reacts by swallowing, retching, or coughing after an airway is in place, the airway must be removed quickly because it may make the patient vomit and increase the likelihood of an airway obstruction.

The best way to ascertain the correct size of an airway is to hold the airway to the side of the face. The lower tip should touch the angle of the jaw just below the earlobe, and the other end should extend beyond the lips. Generally, a size 4 can be used for an adult, size 2 for children, and a size 0 for infants.

To install an airway properly, the patient's mouth should be opened wide using one hand. With the other hand, insert the airway between the patient's teeth with the curve backward at first, then turned to the proper position as it is inserted deeper. This twisting maneuver prevents the tongue from being pushed further back into the throat since the airway must be inserted over the tongue. The airway should be inserted by placing its tip against the roof of the mouth, just behind the upper teeth and sliding it down the throat following the contour of the roof of the mouth until the flange comes to rest at the victim's lips. *Do not push the tongue back into the throat.* At the first sign of a gag reflex, remember to remove the airway. (See Fig. 3–25.)



a. Insert over Tongue

b. Correct Position

Fig. 3–25. Inserting an airway.

Treat for Shock

Although there may be no immediate signs of shock, it should be anticipated and treated before local therapy of the burn wound is initiated. Loss of plasma from severely burned areas lowers the patient's blood volume and causes shock.

Replacement of fluids can be accomplished most effectively through intravenous therapy. Lactated Ringer's Solution 1,000 ml intravenously should be started immediately. Medical advice by radio should be obtained for additional treatment, and plans should be made to evacuate the patient to the nearest medical facility as soon as possible.

A person who is trained adequately to administer intravenous therapy may not be aboard ship. If so, the patient who is not vomiting and is conscious should be given weak solutions of sodium bicarbonate and sodium chloride (½ teaspoonful of baking soda and one teaspoonful of salt to a quart of water) slowly by mouth. The solution should be at room temperature. An adult should be given approximately ½ glass (120 ml) every 15 minutes; a child ¼ glass; and an infant ⅛ glass. The fluids should be discontinued immediately if vomiting occurs.

Relieve Pain

If the adult patient is *not* in shock and there is *no* head injury, morphine sulfate 10 mg may be given intramuscularly for severe pain. (Seek medical advice by radio for a child's proper dosage.) If additional doses of morphine sulfate are required, the condition warrants getting medical advice by radio before continuing the medication. When a patient is in shock, intramuscular medication is not absorbed normally. If one gives repeated doses of morphine sulfate intramuscularly, *an overdose might occur.*

Treat the Burned Area

The medical attendant's hands should be scrubbed and sterile gloves applied before the burned area is treated. (See p. VII–18.) The area should be cleansed gently with water and povidone-iodine solution. All debris and dirt *around* the burned areas should be removed to avoid additional contamination of the area. When cleansing the area, remember:

(1) *No attempt should be made to open blisters or to remove pieces of tissue from the burned surface.* The blisters are not harmful; they protect the underlying tissues against the entry of bacteria.

(2) *No attempt should be made to apply ice water to extensively burned surfaces.* This may increase the patient's shock reaction.

(3) Sulfadiazine silver cream, 1% should be applied in a thin layer to the burned areas and wrapped in sterile dressing. If medical aid is more than 24 hours away, the dressing should be removed, the wounds washed, and sulfadiazine silver cream and dressings reapplied every 24 hours.

After the initial treatment, a more accurate assessment of the burned area should be made. This information should be reported when medical advice by radio is obtained.

After the burned area has been cleansed and the sulfadiazine silver cream applied, multiple layers of sterile dressings should be added to absorb the large amount of fluid that is produced. Roller bandages can be used to hold the dressings in place. If adhesive tape is used to fasten the bandage, it should *not* come into contact with the skin. If the burns are extensive and sterile dressings are scarce, a freshly laundered or ironed sheet can be used.

The face, neck, genitals, and other small areas of skin may be left open to the air, and sulfadiazine silver cream applied, if the burn can be kept clean. There should be no direct contact against bed linens, clothing, or other objects. If the hands and feet are involved, sulfadiazine silver cream should be applied and sterile dressings placed between the fingers and toes to prevent them from sticking together.

Dressings should be left in place for 24 hours unless they become soaked with drainage. If this should occur before the patient can be evacuated from the ship, the dressings should be replaced under as sterile conditions as possible. (See p. VII–16.) If there is evidence of infection, the treatment should be the same as for an infected wound. (See p. III–13.) Fever following serious burns is common, and does not necessarily indicate infection.

When treating burn injuries, *always* remember to examine the patient for other injuries. If there are fractures and lacerations, they should be treated the same as when burns are not present.

Give Tetanus Prophylaxis

Tetanus prophylaxis is recommended for all patients with major burns who have not received a booster dose or a full basic series within the past 12 months. The patient should be given a booster injection of adsorbed tetanus toxoid 0.5 ml subcutaneously, if there is knowledge of previous active immunization within the past five years. If the patient has not been immunized, or has not been immunized in the last five years, tetanus immune human globulin (250 units) should be given intramuscularly in one arm, and adsorbed tetanus toxoid 0.5 ml subcutaneously in the other arm.

RESPIRATORY BURNS

Respiratory burns (see p. III–22) are caused by the inhalation of hot gases and air, particles, and smoke. They should be anticipated when burned areas are found around the mouth, nose, face, hair, and neck. However, sufficient heat from a flash fire may cause edema (swelling) of the larynx with little evidence of other burns.

The patient with a mild injury to the respiratory passages may have only a cough, hoarseness, or a sore throat. Complete obstruction of the respiratory passages may occur as a result of a severe injury. Also, partial collapse of a lung may occur. The patient first may exhibit cyanosis (blue color of the skin), dyspnea (shortness of breath), coughing, wheezing, and hoarseness.

Treatment

An airway must be maintained. An oropharyngeal airway should be inserted (see p. III–22+) and oxygen administered. Medical advice by radio should be obtained. If necessary, plans should be made to evacuate the patient to the nearest medical facility.

ELECTRICAL BURNS

The severity of electrical burns often is difficult to determine because the deeper layers of the skin, muscles, and internal organs may be involved. Also, the burns may be followed by a paralysis of the respiratory center and an irregularity in the beat of the heart. Unconsciousness or instant death may occur.

Treatment

The patient must be removed from the source of the electrical current as quickly as possible, without endangering the rescuer. Electrical lines may be removed with a wooden pole, chair, or other non-metal object. Cardiopulmonary resuscitation (see p. IV–1+) may be required because the shock may affect the patient's heart and lungs. The treatment of the burn would be the same as for any thermal burn of the same extent and depth. This would include relief of pain, prevention and treatment of shock, care of the wound, and control of infection.

CHEMICAL BURNS

Chemical burns occur when acids, alkalis, and other corrosive chemicals come in contact with the skin and mucous membranes. These will include alkalis such as sodium hydroxide (caustic soda, soda lye), potassium hydroxide (lye), and calcium oxide (quick-lime); and such acids as nitric acid, hydrochloric acid, and sulfuric acid. Chlorine, ammonia, mustard gas, and white phosphorus may cause serious burns.

Treatment

The chemical should be washed away immediately with large amounts of water, using a hose or shower, if available. The washing should be continued for a minimum of five minutes. All of the patient's clothing which has become contaminated with the chemical should be removed. *This washing technique must be modified for dry lime and phenol (carbolic acid) burns.* Before washing, the lime should be brushed away gently. Water mixed with the lime reacts chemically to produce heat, which may further burn the skin. Phenol crystals or liquefied phenol should be washed from the skin with ethyl alcohol or isopropyl alcohol, then the skin washed with water.

After copious washing, any chemical remaining should be neutralized carefully. If the appropriate antidote is not known, medical advice by radio should be obtained. Additional treatment would be the same as for any thermal burn of the same extent and depth.

Chapter III

Emergency Treatment of Injuries

Section D

ORTHOPEDIC EMERGENCIES

GENERAL TREATMENT

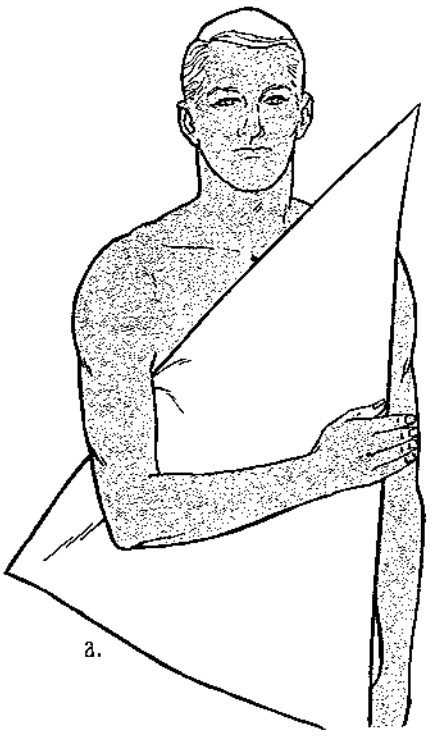
Sprains

A SPRAIN IS AN INJURY to a joint in which the ligaments and other tissues are damaged by violent stretching or twisting. The ankle, wrist, back, and knee joints are the ones most often sprained. Sharp pain and marked swelling are characteristics of this type of injury. Attempts to move or use the joint increase the pain. With severe sprains the patient may be unable to use the injured hand or walk on the injured leg. The skin about the joint may be discolored due to bleeding from torn tissues.

It often is difficult to distinguish between a severe sprain and a fracture. The injury should be treated as a fracture until the advice of a physician can be obtained, or until the patient's improvement reduces the possibility of a fracture. It may be necessary to obtain an X-ray before the extent of the injury can be determined.

Serious sprains may require complete rest in bed for a period of two days to one week. The arm should be placed in a sling if the injury involves an arm or a shoulder. (See Fig. 3–26.) If the hip, thigh, or leg is involved, the leg on the injured side should be elevated by placing a pillow or folded blanket under it. A patient with a sprained back should be placed on his back with a board under the mattress. A pillow under the knees will provide further comfort. A patient with a severe sprain involving the lower back should not stand or walk for several days after the injury, or until the pain has subsided.

Ice bags and cold wet compresses should be applied to the injured area to control swelling and to relieve pain. For severe pain, the patient may be given aspirin 600 mg with



applied firmly, but not too tightly. Fingers and toes should be checked periodically for blue or white discoloration, indicating that the bandage has been applied too tightly. Pain, tingling, loss of sensation, and loss of pulses indicate impaired circulation. The bandage should be loosened if any of these signs or symptoms are present.

Strains

A *strain* is an injury to a muscle or tendon caused by sudden, forcible overstretching due to vigorous muscular effort, such as heavy lifting, running, or jumping. The muscles of the back are involved more often than the thigh and leg muscles. Strains usually occur over the midportion of a long bone, and not at the joint itself. Injuries of this type are characterized by pain, weakness, stiffness, and knotting of the muscles (charley horse). Discoloration may be present due to blood escaping from injured vessels into the tissues.

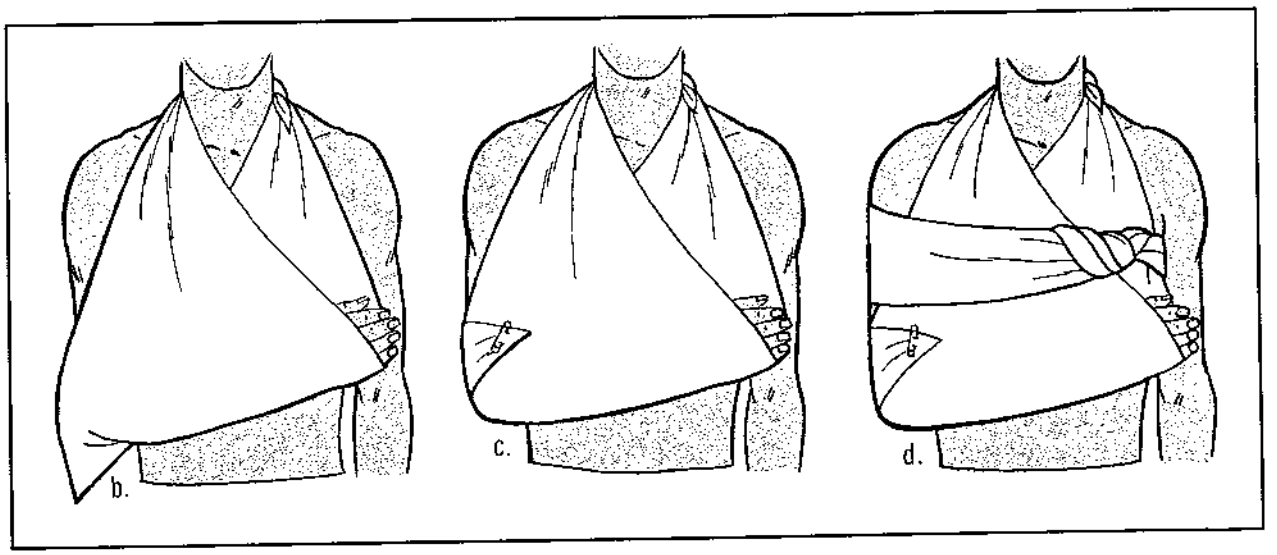


Fig. 3–26. Applying a sling and cravat bandage.

codeine sulfate 30 mg by mouth. Aspirin alone may control the pain after four or five doses. If the patient does not tolerate aspirin, acetaminophen 600 mg should be given with the same frequency. To continue the codeine sulfate, medical advice by radio should be obtained.

The injured joint should be immobilized with pillows, blankets, or bandaged with a wide elastic bandage. The bandage should be

The injured part should be kept at rest in a position that is comfortable for the patient. Heat (preferably moist heat) should be applied to the area involved to relax the muscle spasms. Pain may be relieved and circulation stimulated by rubbing. Often it is difficult to differentiate between a sprain and a strain. If so, the injury should be treated as a sprain for 24 to 48 hours.

Dislocations

A *dislocation* occurs with severe wrenching or twisting of a joint. The ligaments holding the bones in position are stretched and sometimes torn, and the bone ends are forced into an abnormal relationship. A dislocation generally is caused by a blow or a fall, or by strenuous lifting, pulling, or twisting in which a sudden, violent strain is placed on a joint.

Severe pain, rapid swelling, discoloration, and loss of ability to use the joint are characteristic symptoms of this injury. The joint has an abnormal appearance and is generally stiff and immobile. Although a fracture and dislocation can occur at the same time, fractures usually occur between joints. The joints most frequently dislocated are the shoulders and the fingers. The ankle joint often is dislocated and fractured at the same time.

Cold compresses may help to relieve the pain and to keep the swelling down. If severe pain is present, morphine sulfate 10 mg may be given by intramuscular injection. Before repeating the morphine sulfate, medical advice by radio should be obtained.

Treatment for specific dislocations will be discussed later.

Fractures

Fractures are classified as simple or compound. (See Fig. 3–27.)

A simple (closed) fracture is an injury in which the bone has been broken but does not penetrate the skin. Surrounding tissues and blood vessels may suffer damage. Simple fractures that do not produce obvious deformities may be very difficult to detect and may not be discovered without an X-ray. Fractures always should be suspected following a severe injury. The type of accident that is most likely to cause a fracture is a sudden twist, sharp blow, fall, or crushing injury. A fracture may occur even though the injury seems relatively slight. For example, a fracture of the anklebone often is confused with a sprained ankle.

A compound (open) fracture is an injury in which the bone is broken and there is an adjoining wound through the soft tissues and skin. The skin is pierced by the bone end, or from the external source which caused the fracture, such as a gunshot wound or penetrating materials. Careless handling of a patient may change a simple fracture into a compound fracture by forcing the jagged ends of bone

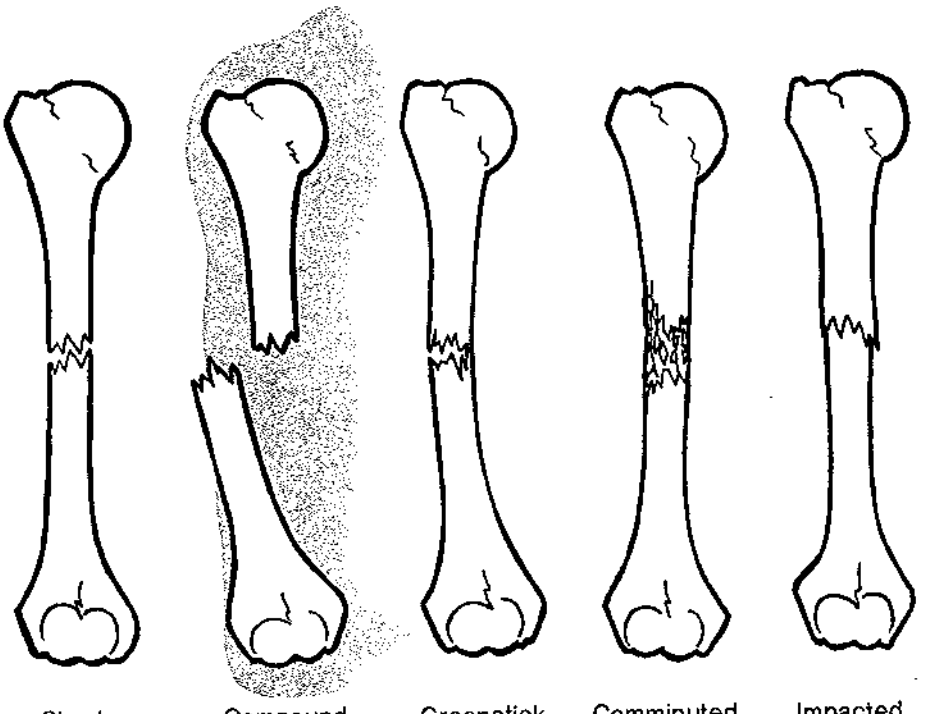


Fig. 3–27. Types of fractures.

through intact overlying skin. A compound fracture should be considered to be present when an open wound is located at or near the site of a fracture.

There are several types of simple and compound fractures. A *greenstick fracture* occurs when a bone does not break completely through. This is common in children because of their soft and pliable bones. There is little or no separation of the bone ends in *fissure or crack fractures.* They require only adequate immobilization to heal. In an *impacted fracture,* one end of the broken bone is driven into the other end. In a *comminuted fracture,* the bone is broken into three or more pieces that may be crushed, splintered, or fragmented. (Fig. 3–27.)

Fractures, whether simple or compound, usually cause severe pain. Although pain generally is present at the fracture site, the area around the injury may be tender to the touch. Swelling almost always occurs immediately and discoloration of the skin may follow. It may be difficult or impossible for the patient to move the part beyond the injury. However, because the part can be moved, it does not rule out the possibility of a fracture. Also, he may be reluctant to move the part because of the severe tenderness and throbbing pain. Even if the bone is cracked, the part may be moved without difficulty. When the part is moved, the patient may feel a grating sensation as the ends of the bones rub together. Unnecessary movements should be avoided as the grating may increase the damage to the bone ends and soft tissue. The injured part may be deformed or may be in an unnatural position. One limb may be shorter than the other if the broken ends of the bone overlap. Compound fractures may be accompanied by serious bleeding, and shock is likely to develop, especially if a large bone is involved.

Medical advice by radio should be sought early because it might be necessary to evacuate a patient with a compound fracture.

General Treatment

Unless there is an immediate danger of further injury, the patient should not be moved until bleeding is controlled, and all fractures are immobilized by splinting. A pressure dressing can be devised to control almost any bleeding from wounds in compound fractures. A tourniquet is rarely, if ever, indicated. Bulky sterile dressings can be applied and held firmly in place with an elastic bandage. If the bleeding is severe, it may bleed through this dressing. More bulky sterile dressing should be added and the elastic bandage tightened. The fingers or toes beyond the break should be examined at intervals to assure adequate circulation. If they become bluish or white, the dressing should be loosened. As soon as temporary splinting has been applied, the patient should be placed carefully into bed as quickly as possible.

If the patient is in severe pain, morphine sulfate 10 mg may be given by intramuscular injection. To repeat the dosage medical advice by radio should be obtained. Care should be taken not to aggravate pain by moving or roughly handling the injured part.

The pressure dressing, placed over the wound in compound fractures, should be removed after approximately one hour. If bleeding is well controlled, the wound can be treated. The area around the wound should be cleansed thoroughly with soap and water, after which surface washings should not be allowed to spill into the wound. *The wound itself should not be washed.* The wound should be covered with a sterile dressing. Particles of dirt, pieces of clothing, wood, and metal should be removed gently from the wound with a sterilized forceps. Blood clots should not be disturbed as this may cause fresh bleeding. One should not probe for deeply buried objects. Isopropyl alcohol or other anti-infective solutions should not be applied because they will irritate damaged tissue. The wound should not be sutured. A sterile gauze compress or pad should be placed over the wound, and gauze bandage or elastic bandage used to secure it. As a general rule, dressings should be allowed to remain in place four or five days. Changing them earlier is justified only if evidence of wound infection develops.

If a long bone in the arm or leg has been fractured, it should be straightened carefully. Traction should be applied on the hand or the foot, and the limb moved back into position. (See Fig. 3–28.) Compound fractures of joints, such as the elbow or knee, should not be manipulated. They should be placed gently into a

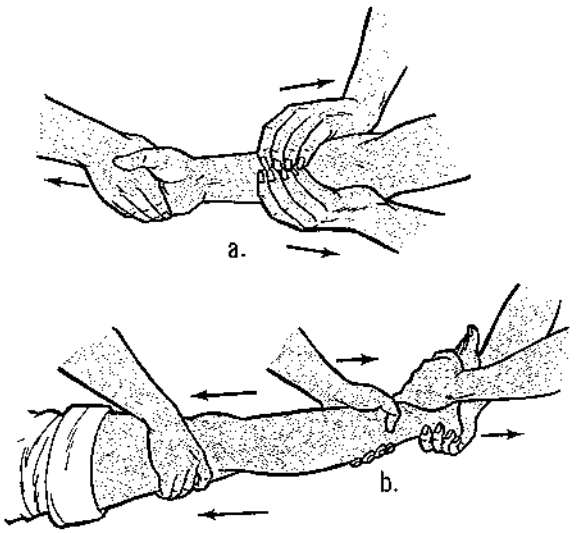


Fig. 3–28. Straightening a fractured limb.

proper position for splinting. The knee should be splinted straight. The elbow should be splinted at a right angle. Inflatable splints (see Fig. 3–32) may be used for some fractures; others will require a different type of splinting. To provide adequate stability, the splint should be long enough to extend beyond the joints at the end of the fractured bone. Splinting will be covered in more detail later in the treatment of specific fractures.

The advice of a physician on handling these injuries should be obtained by radio as soon as possible.

HEAD

Skull

A fracture of the skull may be caused by a fall, direct blow, crushing injury, or a penetrating injury such as a bullet wound. The patient may be conscious, unconscious, or dizzy, and have a headache or nausea. Bleeding from the nose, ears, or mouth may be present; and there may be paralysis and signs of shock.

Treatment

The patient with a head injury should receive immediate attention to prevent additional damage to the brain. The patient should be kept lying down. If the face is flushed, the head and shoulders should be elevated slightly. If the face is pale, the head should be kept level with the body or slightly lower. Bleeding can be controlled by direct pressure on the temporal or carotid arteries. The patient should be moved carefully with the head supported on each side with a sandbag. *Depressant drugs, such as morphine sulfate never should be given.*

Upper Jaw

In all injuries of the face, an adequate airway must be considered first. (Refer to Cardiopulmonary Resuscitation, p. IV–1+.)

Treatment

If there are wounds, bleeding should be controlled. Dental consultation should be obtained after the patient has been transported to a medical facility. Loose teeth should not be removed without medical advice by radio, unless it is feared that they will be swallowed or block the airway.

Lower Jaw

A dislocation or fracture of the lower jaw may occur as a result of a direct blow or fall. The pain from the injury is likely to become severe when an effort is made to open or close the jaw. A fracture may cause a deformity of the jaw, missing or uneven teeth, bleeding from the gums, swelling, and difficulty in swallowing. Dental consultation should be obtained after the patient has been transported to a medical facility. Dislocation of the lower jaw may be associated with a fracture of the lower jaw and other facial injuries. A lower jaw dislocation may occur simply from opening the mouth too wide while yawning or eating. In the most common type of acute dislocation, the lower jaw is locked open to make eating and talking almost impossible. Medical advice by radio should be obtained on the proper course of action.

Treatment

The injured jaw may interfere with breathing. If this occurs, the jaw and tongue should be pulled forward and maintained in that position. (Refer to Cardiopulmonary Resuscitation, p. IV–1+.) If unconscious, the patient should be placed on his side or on his stomach, with the face tilted to one side to avoid aspiration of blood, mucus, and vomitus.

Application of cold compresses may reduce the swelling and pain. The patient's jaw must be immobilized by closing his mouth as much as possible (depending on the degree of deformity) and applying a bandage. (See Fig. 3–29 for method *a* or method *b*.) If the patient is unconscious, bleeding from the mouth, or there is danger of vomiting, an attendant must be present at all times to loosen the bandage when an emergency occurs.

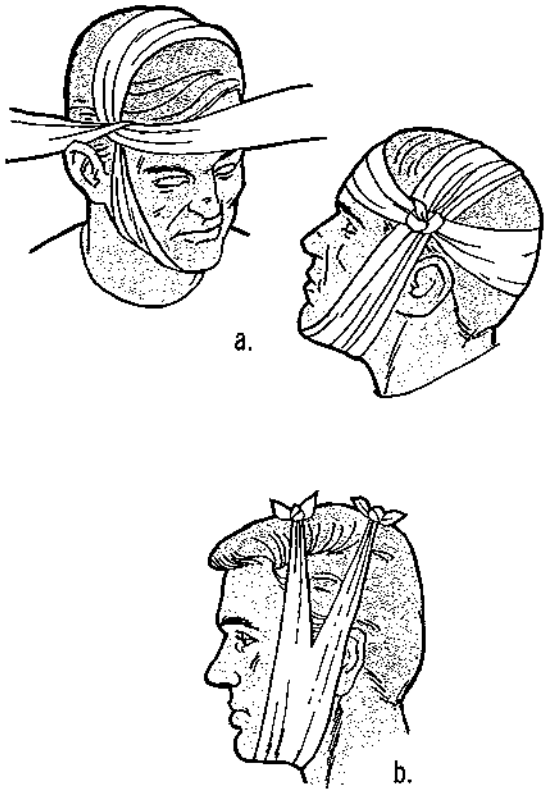


Fig. 3–29. Bandages for a fracture of the jaw: method a or method b.

Aspirin 600 mg with codeine sulfate 30 mg by mouth, or acetaminophen 600 mg with codeine sulfate 30 mg by mouth may be given for pain. To repeat the codeine sulfate, or if the patient cannot take oral medication, medical advice by radio should be obtained.

Nose

A fracture of the nose usually is caused by a direct blow. Generally, there will be pain, swelling, bleeding, and a deformity which is easy to detect.

Treatment

The patient should be positioned so the head is tilted slightly backward. If the bleeding does not stop in a few minutes, cold compresses or an ice bag should be applied to the injury. A permanent deformity of the nose may occur as a result of the fracture, so medical attention should be obtained upon returning to port.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

CLAVICLE (COLLARBONE)

Fractures of the clavicle are common and usually are the result of falling with the hand outstretched. The force from the fall is transmitted to the shoulder. Usually the fracture is easy to detect because the clavicle lies immediately under the skin and a deformity can be seen easily. Also, the fracture can be detected by feeling the bone with the fingers and noting a tender or swollen area. There is pain and tenderness, and a grating sensation can be felt. The shoulder on the injured side may droop downward and forward.

Treatment

Because splints for these fractures are difficult to apply, only a physician should put them on. If clavicle splints are applied tightly enough to immobilize the fracture, the compression of the blood vessels and nerves at the armpits might endanger the arm. The fracture should be treated by supporting the arm in a simple sling on the injured side. The sling will remove weight from the clavicle which helps to support the arm. The arm and sling should be secured to the body with a wide cravat bandage. (See Fig. 3–26.)

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

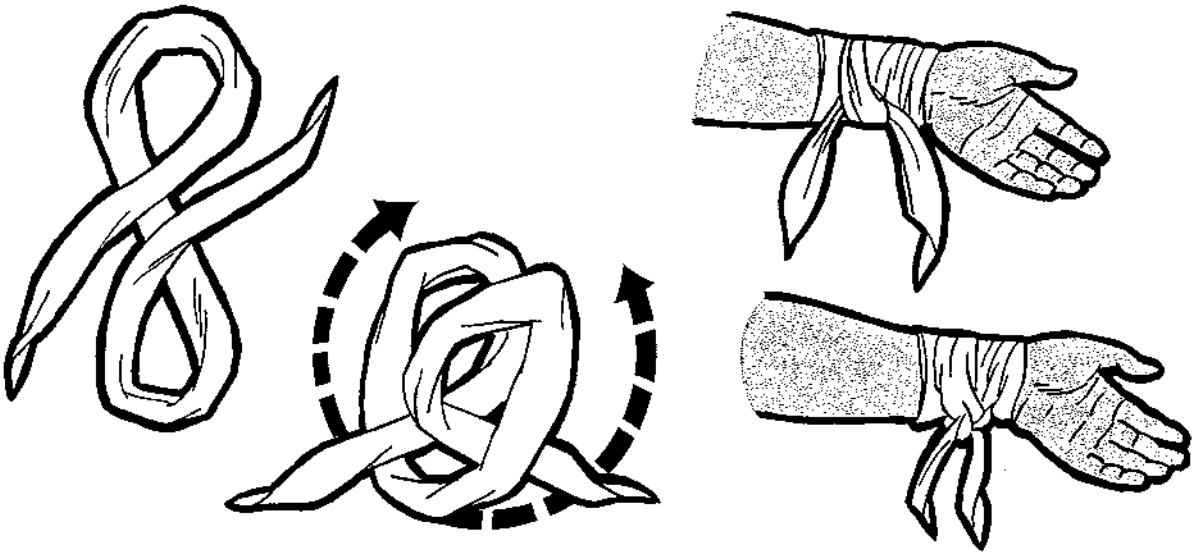


Fig. 3–30. Clove hitch bandage.

SCAPULA (SHOULDER BLADE)

Fractures of the scapula generally are due to direct trauma and are not common. Usually they are simple fractures with little displacement. There is pain and swelling, usually coupled with inability to swing the arm. The patient should be examined further, as there may be associated injuries from the blow.

Treatment

A sling should be applied to the arm on the injured side, and the sling and arm secured to the body by a wide cravat bandage. (See Fig. 3–26.)

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained for a patient with a fractured scapula.

DISLOCATION OF SHOULDER

An injury to the shoulder which results in complete loss of function is more apt to be a dislocation than a fracture. There is a sagging of the shoulder with the elbow held away from the body at an awkward angle. Extreme pain is present in the shoulder region. The head of the humerus often may be felt in an abnormal position. A history of previous dislocations may be described by the patient.

Treatment

No attempt should be made to reduce the dislocation, *if a physician can be reached within 24 hours.* The arm should be placed in a sling. (See Fig. 3–26.) If severe pain is present, morphine sulfate 10 mg may be given by intramuscular injection. To repeat the morphine sulfate, medical advice by radio should be obtained.

If the dislocation must be reduced, medical advice by radio should be obtained. Sometimes it can be reduced without active manipulation. The patient should be given 10 mg of morphine sulfate intramuscularly and allowed to rest quietly for 30 minutes to one hour before the reduction is attempted. A clove hitch bandage should be applied to the wrist on the side of the injury. (See Fig. 3–30.) Then the patient should be placed face down on a table with his shoulder and arm hanging over the side. A bucket with 10 to 15 pounds of weight in it should be attached to the clove hitch. (See Fig. 3–31.) The weight of his arm and the additional weight of the bucket will gradually stretch the tight muscles about the dislocated joint and pull it back into position. Often the dislocation will reduce in 10 to 15 minutes, but may require as long as 30 minutes to one hour.

To repeat the morphine sulfate, medical advice by radio should be obtained.

Following reduction of the dislocation, the arm should be placed in a sling, with the arm

and sling secured to the body by a wide cravat bandage. (See Fig. 3–26.)

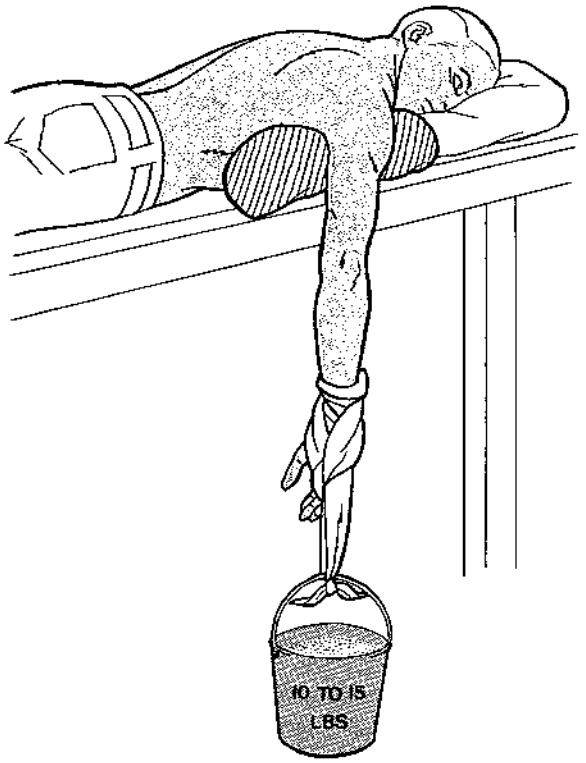


Fig. 3–31. Reduction of a dislocated shoulder.

HUMERUS (UPPER ARM AND ELBOW)

Complications may occur in fractures of the humerus because of the closeness of the nerves and blood vessels to the bone. There is pain and tenderness at the fracture site and an obvious deformity may be present. The patient may be unable to lift his arm or to bend his elbow.

Treatment

A full arm, inflatable air splint should be applied to the fracture. (See Fig. 3–32.) If inflatable splints are not available, the arm should be placed in a sling, with the sling and arm secured to the body by a wide cravat bandage. (See Fig. 3–26.) A short padded splint, applied to the outer surface of the arm, may be used in addition to the above procedure. (See Fig. 3–33.) The *elbow* should not be bent, if it does not bend easily. Long, padded splints should be applied, one to the outer surface and the other to the inner surface of the arm. If there is any possibility that the *elbow* is involved in the *fracture,* the joint should be immobilized with a splint. (See Fig. 3–34.)

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient,

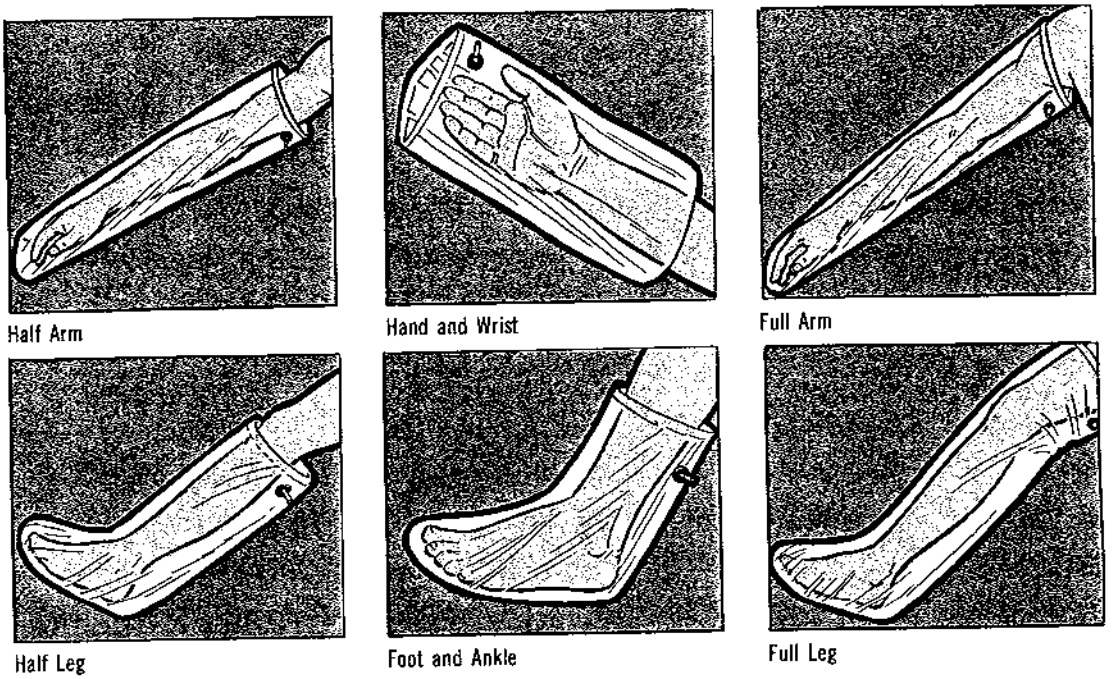
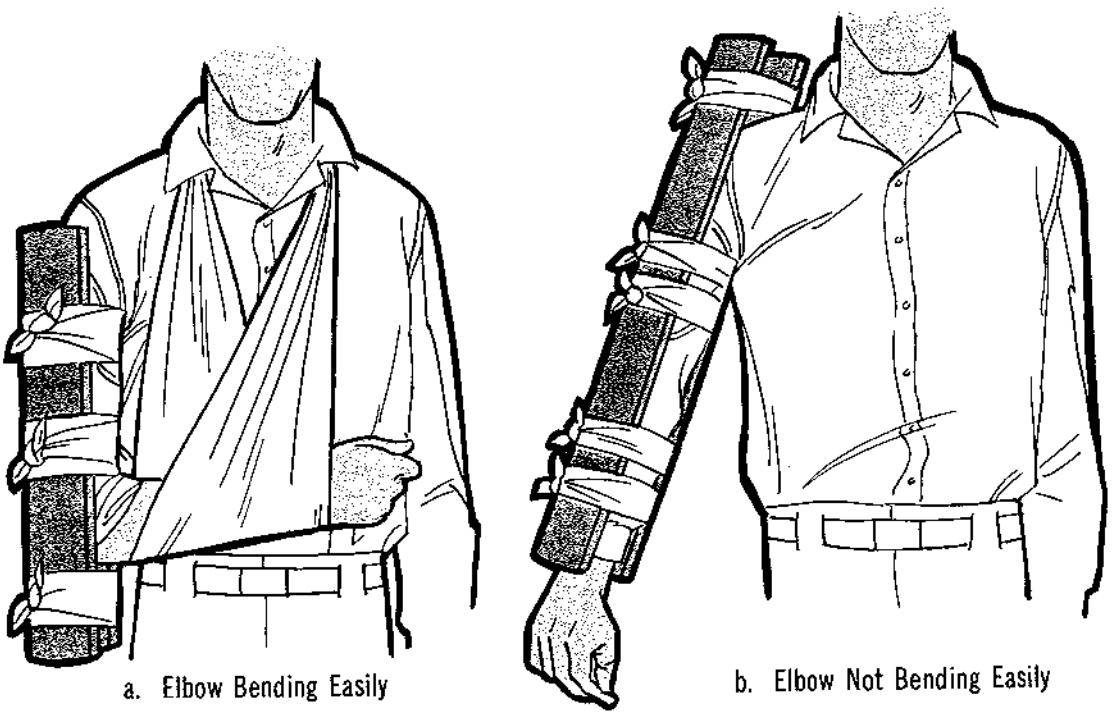
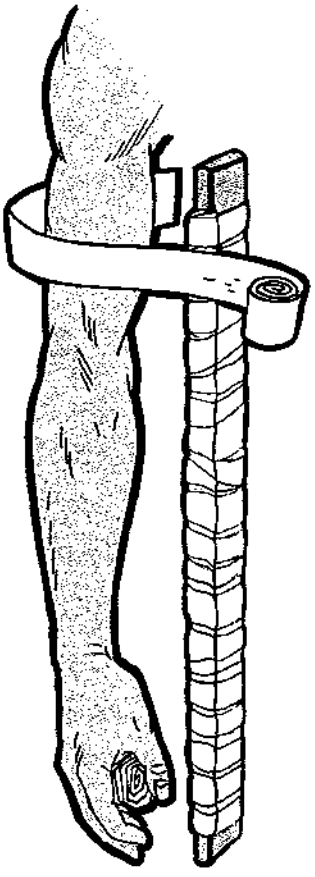


Fig. 3–32. Inflatable air splints.



a. Elbow Bending Easily b. Elbow Not Bending Easily

Fig. 3–33. Splinting a fractured humerus.

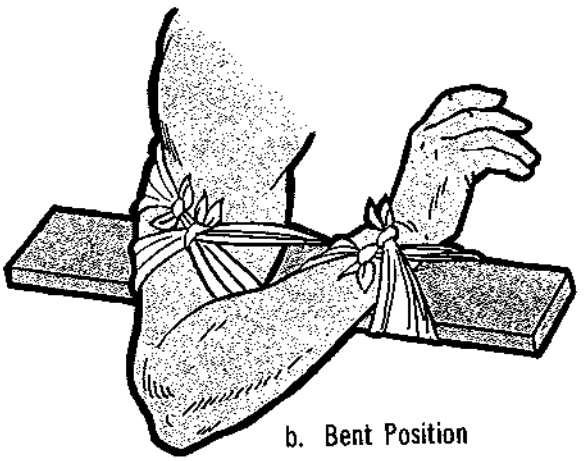


a. Straight Position

acetaminophen may be tried at the same dosage and frequency. To repeat the codeine sulfate, medical advice by radio should be obtained.

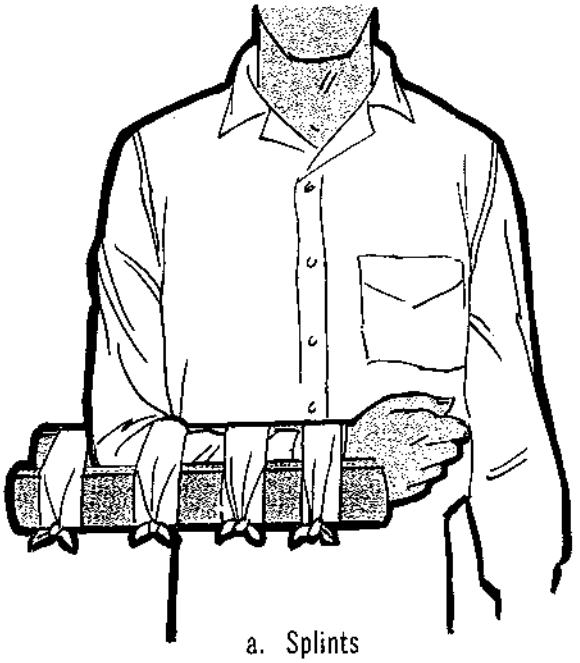
RADIUS AND ULNA (LOWER ARM)

There are two large bones in the forearm, and either one or both bones may be broken. When only one bone is broken, the other acts as a splint and there may be little or no deformity. However, a marked deformity may be present in a fracture near the wrist. When both

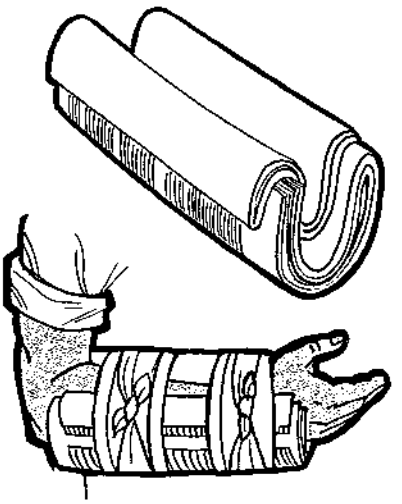


b. Bent Position

Dislocated or fractured elbow.



a. Splints



b. Magazine

c. Jacket Flap

d. Shirttail

Fig. 3–35. Splinting a fractured forearm.

bones are broken, the arm usually appears deformed. In any fracture of the forearm, pain, tenderness, swelling, and inability to use the forearm may be present.

Treatment

The fracture should be straightened carefully by applying traction on the hand. (See Fig. 3–28.)

A half arm, inflatable air splint should be applied to the fracture. (See Fig. 3–32.) If inflatable splints are not available, two well-padded splints should be applied to the forearm: one on the top and one on the bottom. (See Fig. 3–35.) The splints should be long enough to extend from beyond the elbow to the middle of the fingers. The hand should be raised about four inches higher than the elbow, and the arm supported in a sling. (See Fig. 3–35.) An improvised splint could be applied, if other splints are not available.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. To repeat the codeine sulfate, medical advice by radio should be obtained.

WRIST

The wrist usually is broken by falling with the hand outstretched. Usually a lump-like deformity occurs on the back of the wrist, along with pain, tenderness, and swelling.

Treatment

A fracture of the wrist should *not* be manipulated or straightened. In general, the fracture should be managed like a fracture of the forearm.

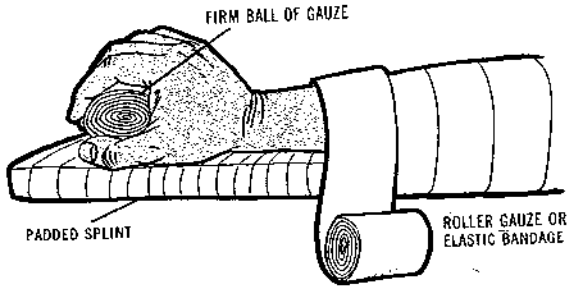


Fig. 3–36. Splint for crushed or fractured hand.

HAND

Crushed Hand

The hand may be fractured by a direct blow or may receive a crushing injury. There may be pain, swelling, loss of motion, open wounds, and broken bones.

Treatment

When there are open wounds, refer to Treatment of Wounds (p. III–3+). The hand should be placed on a padded splint which extends from the middle to the lower arm to beyond the tips of the fingers. A firm ball of gauze should be placed under the fingers to hold the hand in a cupped position. Roller gauze or elastic bandage may be used to secure the hand to the splint. (See Fig. 3–36.) The arm and hand should be supported in a sling. (See Fig. 3–26.) Often, further treatment is urgent, regardless of the severity of the injury, to preserve as much of the function of the hand as possible. Medical advice by radio should be obtained.

Finger Dislocation

The fingers are injured easily and even a minor injury may cause a dislocation. The injury is recognized readily by the abnormal position of the two adjoining bones. There will be pain, swelling, and shortening of the finger; and the patient may be unable to bend the finger in the injured area.

Treatment

Before a reduction is attempted, morphine sulfate 10 mg may be given by intramuscular injection for pain, and the patient allowed to rest quietly for 30 minutes to one hour. To repeat the morphine sulfate, medical advice by radio should be obtained. The patient should be lying down before the procedure is started, and the hand should be placed in a position with the palm down. The finger should be grasped *above* and *below* the injured joint, with a small dressing to prevent slipping. Strong, steady traction should be applied, pulling straight out from the hand. The bone usually will slip into

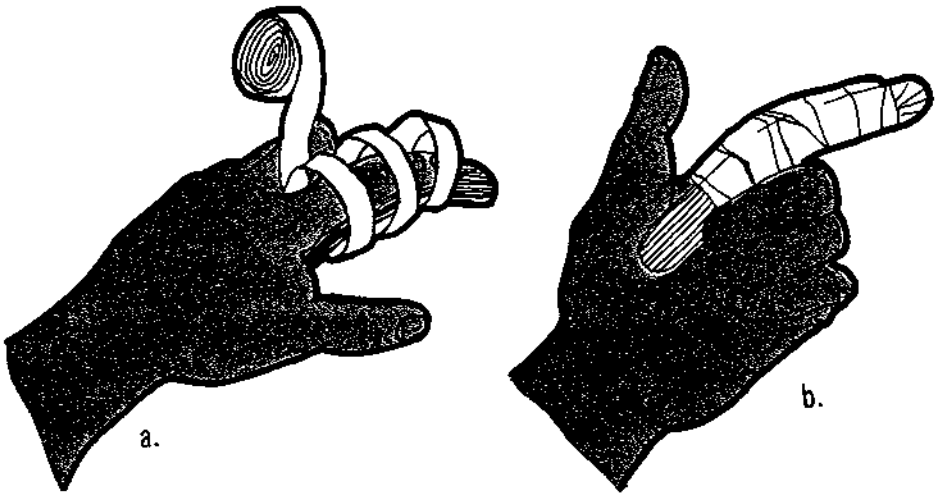


Fig. 3–37. Dislocated or fractured finger.

position with ease. If traction is applied to more than one joint, another dislocation could occur.

The injured finger should be immobilized with a malleable splint. (See Fig. 3–37.) The arm should be placed in a sling. (See Fig. 3–26.) The patient should be examined by a physician on arrival in port.

Fractured Finger

The finger or thumb may be fractured by a direct blow, a crushing injury, a blow to the end of the finger, or when forced into sudden flexion or hyperextension.

Treatment

Only the fractured finger should be immobilized, and the mobility of the other fingers should be maintained. The finger should be straightened by grasping the wrist with one hand and applying traction to the fingertip with the other. The finger should be immobilized with a maliable splint using the procedure described earlier for a dislocated finger. (See Fig. 3–37.) The patient should be examined by a physician as soon as possible.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

SPINE (BACKBONE)

The treatment of a fractured spine should be aimed at minimizing shock and preventing further injury to the spinal cord. If a patient complains of acute pain in the back of the neck following an injury, it would be advisable to treat the injury as a fracture, even if no other symptoms appear.

Cervical (Neck)

Fractures of the neck are not common on shipboard. However, they may occur as a result of a fall from a high place, or from a blow to the neck or head by a heavy moving object.

The patient usually will complain of severe pain at the site of the fracture, with tingling or numbness. If the spinal cord has been damaged, there may be paralysis down from the site of the fracture. Usually there is severe shock which may be delayed for a period of time. Patients with neck paralysis may not be able to urinate; but they should not be catheterized, unless advised to do so by a physician. Medical advice by radio should be obtained.

Treatment

To treat a fractured neck one person should hold the patient's head straight and apply gentle traction, while another person applies a cervical collar. (See Fig. 3–38.) Using several people, the patient should be rolled onto his side while supporting the neck, and a long spine

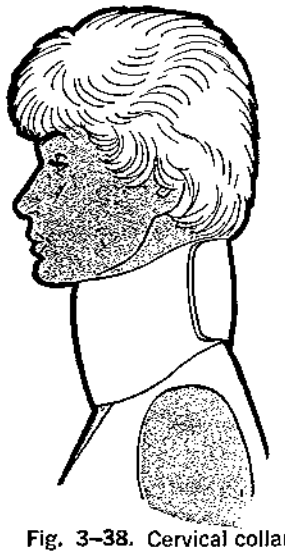


Fig. 3–38. Cervical collar.

board placed next to him. (See Fig. 3–39.) After he has been rolled onto the board, he should be strapped securely to it. (Fig. 3–40.)

If a spine board is not available, any long board may be used. This board should be long and wide enough to contain completely the patient's head and body. If a cervical collar is not available, the patient's head should be held straight, and gentle traction applied during turning and positioning on the spine board. Traction should be maintained until the head is immobilized completely. Clothing, about the thickness of a rolled bath towel should be placed under the neck to support it. A sandbag, or similar material, should be placed on each side of the head, and the head secured to the board with a cravat bandage. For cervical fractures,

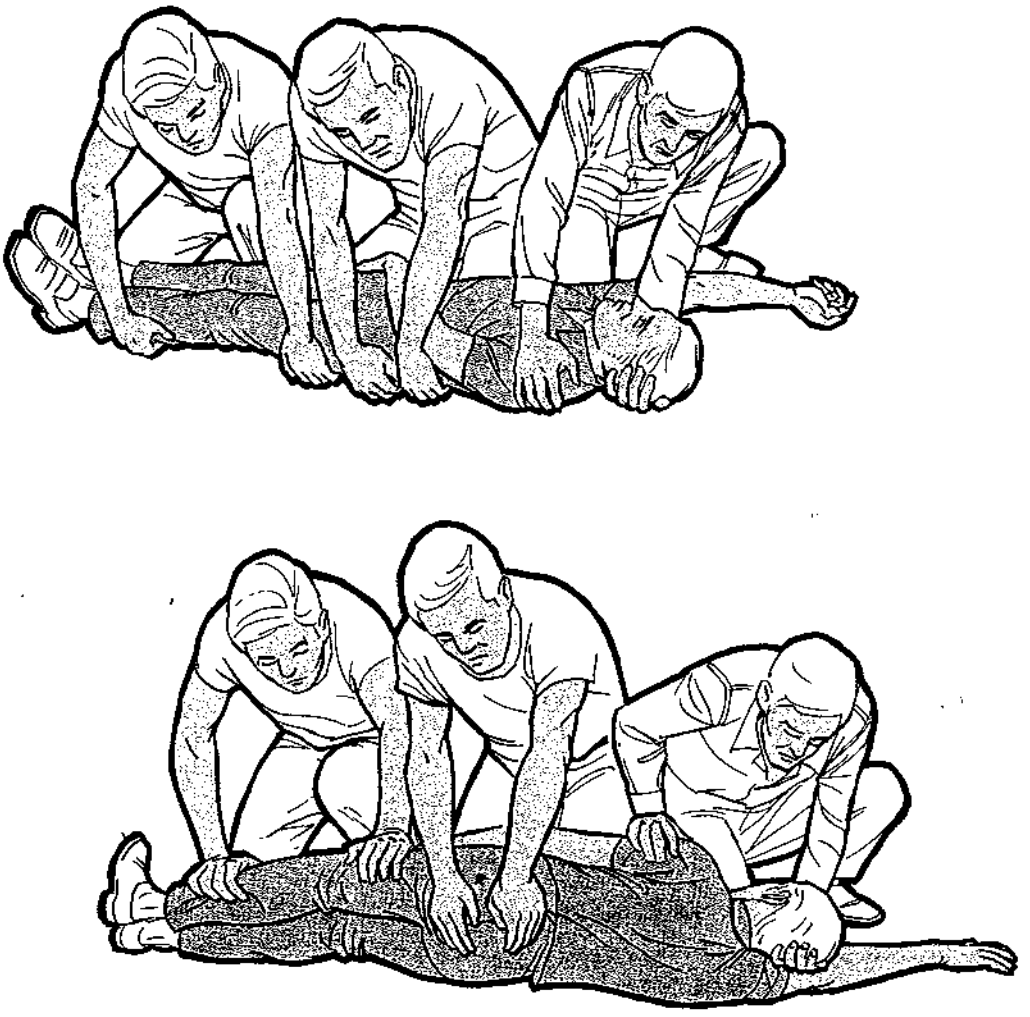


Fig. 3–39. Rolling a patient onto his side.

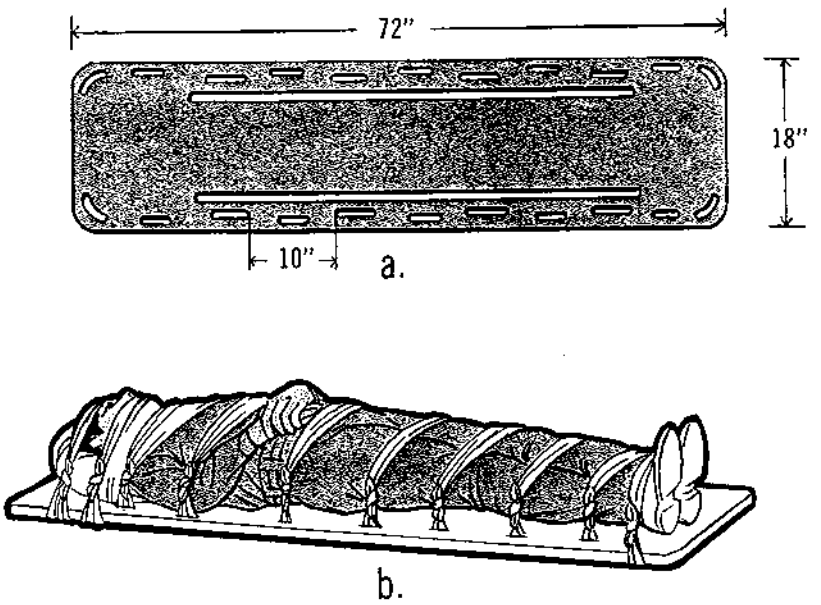


Fig. 3–40. Long spine board.

a short spine board also can be used, depending on the position and location of the patient. It should be placed behind the patient and all straps secured. (See Fig. 3–41.) Then the patient should be placed on a stretcher and transferred to a bed in his quarters or sickbay. The bed should have a board placed beneath the mattress. The cervical collar should be left in place, and the patient cautioned against undue movements. If the patient does not have a cervical collar, sandbags should be placed on each side of the head to assure immobilization.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If

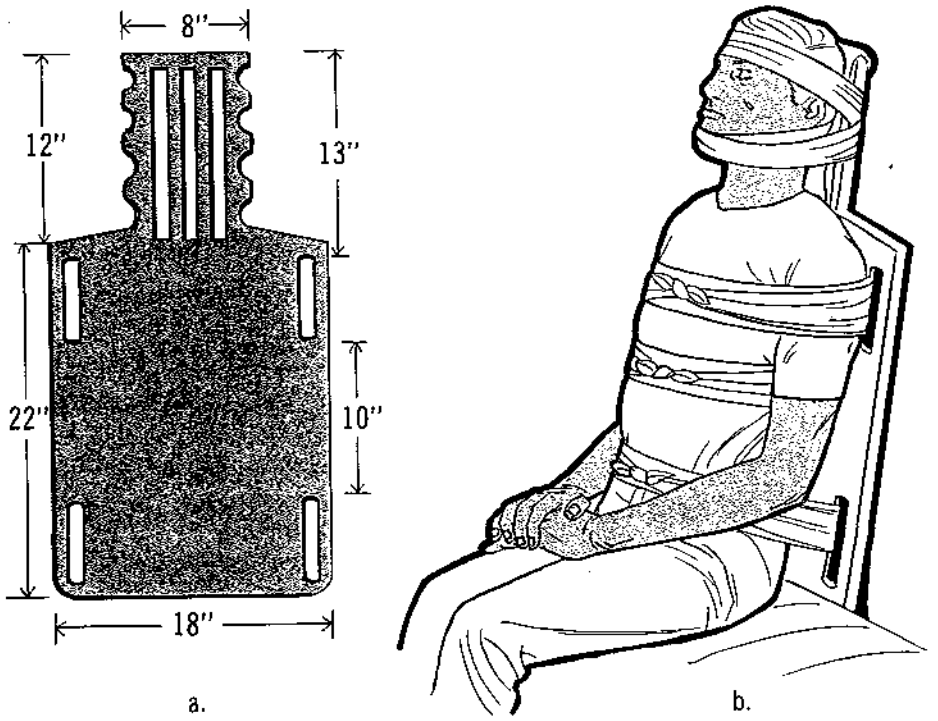


Fig. 3–41. Short spine board.

aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

Because medical attention is needed urgently, evacuation of these patients by helicopter should be discussed by radio.

Thoracic and Lumbar (Back)

Fractures of the back are not common but do occur occasionally aboard ship. They may occur as a result of a fall from a height, a fall across a rail, a crushing injury, or a sharp blow to the spine.

The symptoms of a fractured back are similar to the symptoms of a fractured neck. If the spinal cord is damaged, paralysis may occur below the site of the injury. Pain may be severe, or there may be a little discomfort with only a tender area around the spine. As with all spinal fractures, the danger lies in the possibility of damage to the spinal cord. *Correct handling of the patient is crucial.* The slightest displacement of a fractured vertebra may damage the spinal cord, producing paralysis below the point of injury.

Treatment

The patient should be transported lying in a face-down position. If this is not possible, padding should be placed under the small of the back to retain it in its natural position. Refer to Cervical (Neck) p. III–37 + for rolling and positioning of the patient on a long spine board or any long board. *The patient's body must not be twisted or bent when moving him or further damage may occur to the spinal cord.* The patient may be placed on his back after he has been transferred to a bed with a large board under the mattress. The proper position must be maintained, and the patient should be cautioned against undue movement.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

RIB

A fractured rib is the most common injury to the chest and usually is caused by a direct blow or a crushing injury. There will be pain at the fracture site, with little displacement or deformity. There may be severe pain when breathing, bending, or coughing. The patient may press his hands against the chest to prevent painful movement. If the lung has been punctured, bright red, frothy blood may be coughed up.

Treatment

If the patient is fairly comfortable, it will not be necessary to apply anything to the chest. If there is severe pain, the ribs can be immobilized somewhat by applying adhesive tape. If the patient should become short of breath, the tape should be removed. If necessary, an elastic bandage may be applied in place of the adhesive tape. (Refer to p. III–47, for treatment of a Punctured Lung.)

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

HIP

Dislocation of Hip

A hip may be dislocated by a fall, a blow to the thigh, or direct force to the foot or knee. A fracture may be present as a result of the great force required to dislocate the hip. There will be severe pain and loss of motion, and a marked deformity may be present.

Treatment

No attempt should be made to reduce a dislocation of the hip. The injury is serious and should be treated only by a physician. The patient should be transported on a long spine board. (See Fig. 3–40.) A blanket, pillow, or other suitable padding should be used to support the legs in the position of the deformity. This position should be maintained after the patient has been transferred to a bed in his quarters or the sickbay.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

Fracture of Hip

A fractured hip usually is caused by a fall. There is severe pain in the groin area, and the patient may not be able to lift the injured leg. The leg may appear shortened and be rotated, causing the toes to point abnormally outward. Shock generally will accompany this type of fracture.

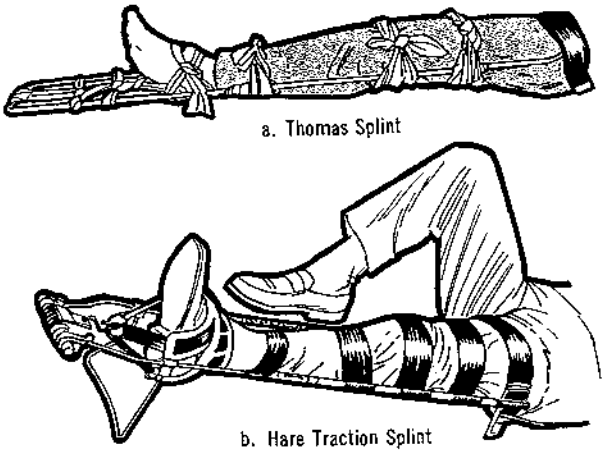


Fig. 3–42. Half ring traction splints.

Treatment

A fracture of the hip should be splinted with a half-ring traction splint—a Thomas or Hare Traction Splint. (See Fig. 3–42.) If one is not available, a well-padded board splint should be placed from the armpit to beyond the foot. Another well-padded splint should be placed on the inner side of the leg from the groin to beyond the foot. The splints should be secured in place with an adequate number of ties, and both legs tied together to provide additional support. (See Fig. 3–43.) The patient

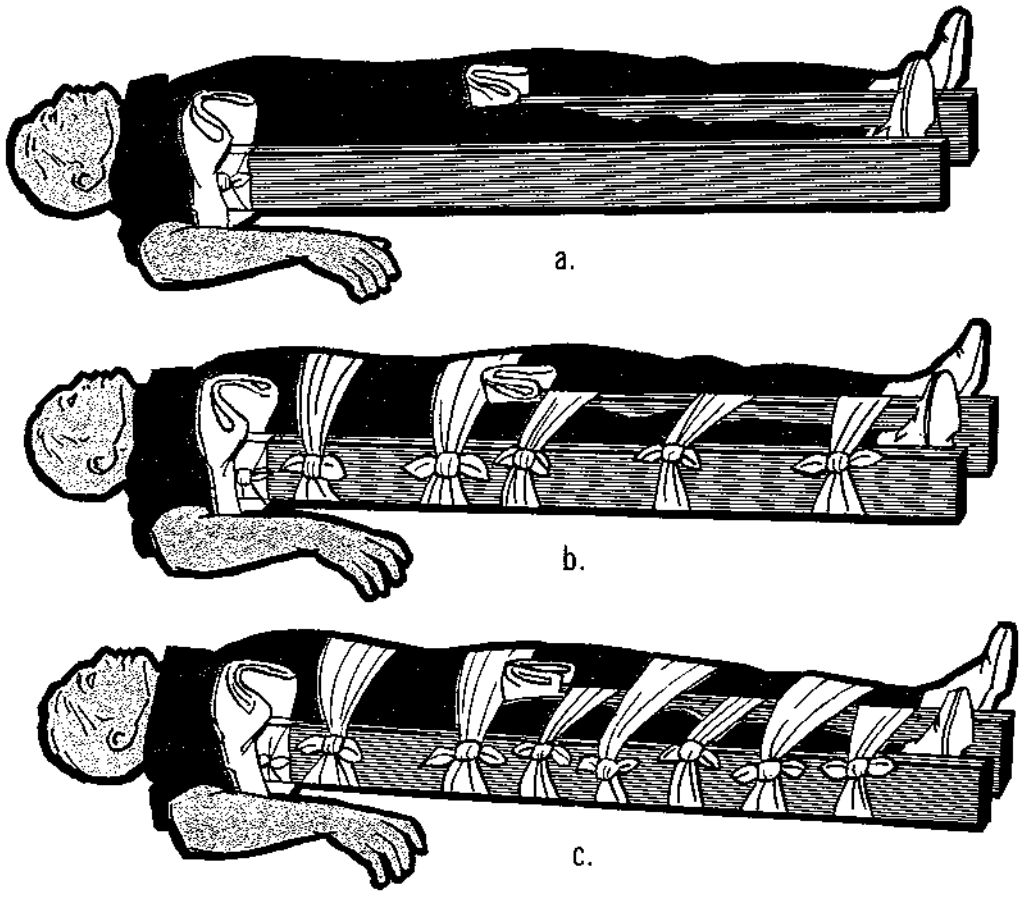


Fig. 3–43. Fractured hip or femur.

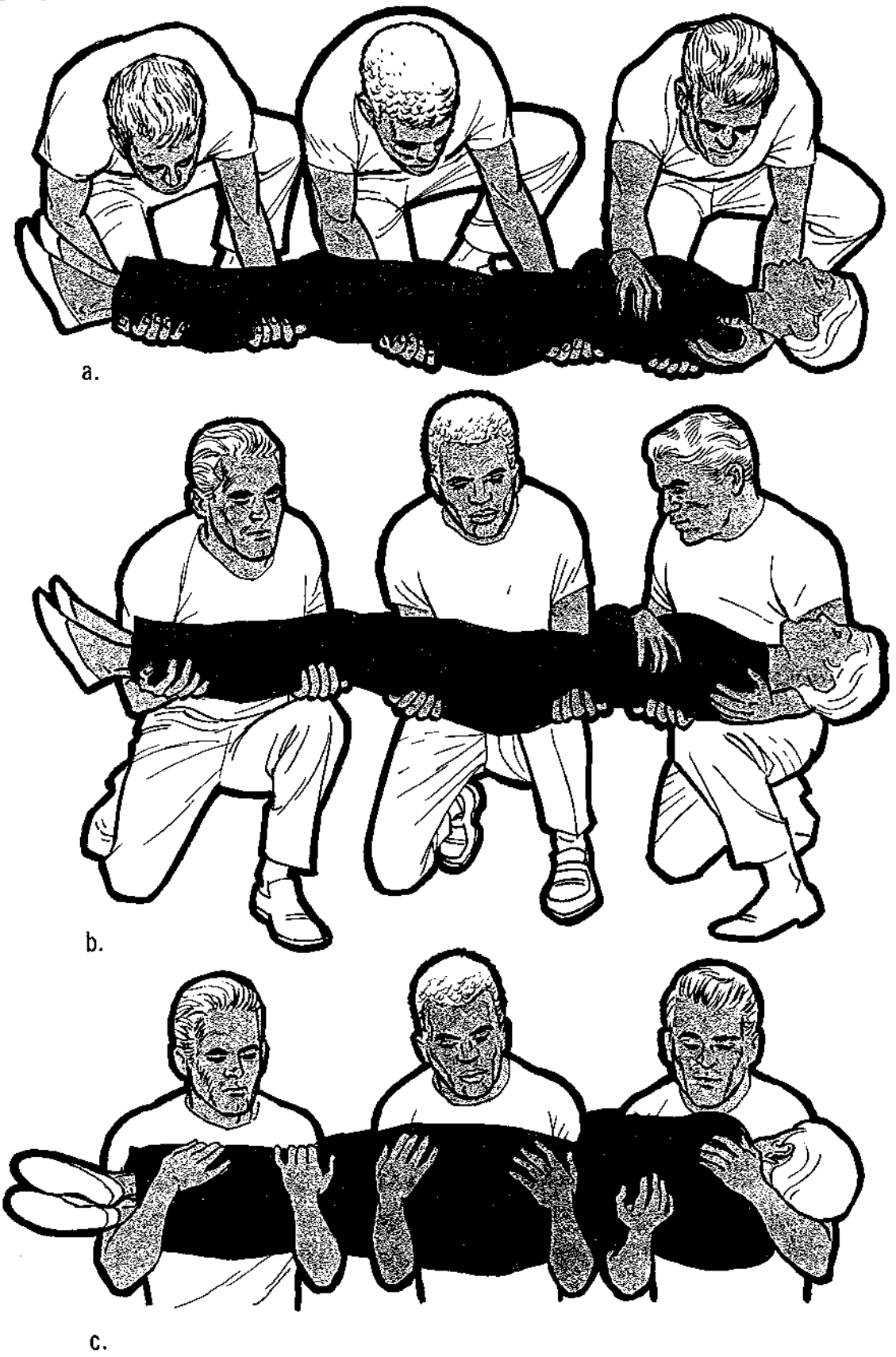


Fig. 3–44. Lifting a patient (three persons).

should be transported on a long spine board to a bed in his quarters or sickbay. (See Fig. 3–40.) If a backboard is not available, a stretcher may be used.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

PELVIS

Pelvic fractures usually are caused by falls, crushing accidents, and sharp blows. Severe pain, shock, internal bleeding, and the loss of ability to use the lower extremities may be present. The bladder may be injured or ruptured, as well as other organs which are protected by the pelvis.

Treatment

The patient with a fractured pelvis should be treated for shock, but not placed in a shock position. A long spine board or rigid stretcher will provide the necessary support during transportation. If possible, four people should be used to lift the patient onto the spine board. (See Fig. 3–44.) Rolling the patient may cause additional internal damage. A pad should be placed between the patient's thighs, and the knees and ankles bandaged together. The patient may be placed on the spine board with the knees straight or bent, whichever position is more comfortable. If the knees are flexed, padding should be placed under them for support. The patient should be secured firmly to the spineboard both above and below the pelvis. (See Fig. 3–45.)

If medical care by a physician is to be delayed, the patient with a pelvic fracture is best treated by placing him on a bed that has a firm mattress or a board which is under the mattress.

For severe pain, morphine sulfate 10 mg may be given by intramuscular injection. Before repeating the morphine sulfate, advice by radio should be obtained.

FEMUR (THIGH)

A fracture of the femur usually is caused by a fall or direct blow. There will be severe pain, a shortening of the leg, deformity, and a grating sensation. The limb has a wobbly motion, and below the fracture, there is a complete loss of control. Severe damage to the nerves and blood vessels may occur.

Treatment

The injured leg should be straightened carefully by applying gentle traction on the foot. (See Fig. 3–28.) If available, the fracture should be splinted with a half-ring traction splint—a Thomas or Hare Traction Splint. (See Fig. 3–42.) The traction of the limb will reduce pain and tissue damage during transportation. If a traction splint is not available, a full leg, inflatable splint may be applied. (See Fig. 3–32.) If necessary, the fracture may be splinted with long, well-padded board splints. For the procedure, see fracture of the hip, p. III–41+.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

KNEE

A fracture of the knee generally occurs as a result of a fall or a direct blow. Besides the usual signs of a fracture, a groove in the kneecap may be felt. There will be an inability

Fig. 3–45. Pelvic fracture.

to kick the leg forward, and the leg will drag if an attempt is made to walk.

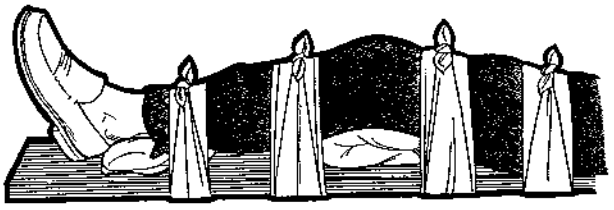


Fig. 3–46. Splinting fractured kneecap.

Treatment

The leg should be straightened carefully. (See Fig. 3–28.) A full leg, inflatable air splint should be applied. If other types of splints are used, a well-padded board splint should be placed with padding under the knee and below the ankle. The splint should be secured in place with ties. (See Fig. 3–46.) When splints are not available, a pillow or a blanket may be used to immobilize the knee.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

TIBIA AND FIBULA (LOWER LEG)

Fractures of the lower leg are common and occur as a result of various accidents. There is a marked deformity of the leg when both bones are broken. When only one bone is broken, the other acts as a splint and little deformity may be present. When the tibia (the bone in the front of the leg) is broken, a compound fracture is likely to occur. Swelling may be present and the pain usually is severe enough to require morphine sulfate (see below).

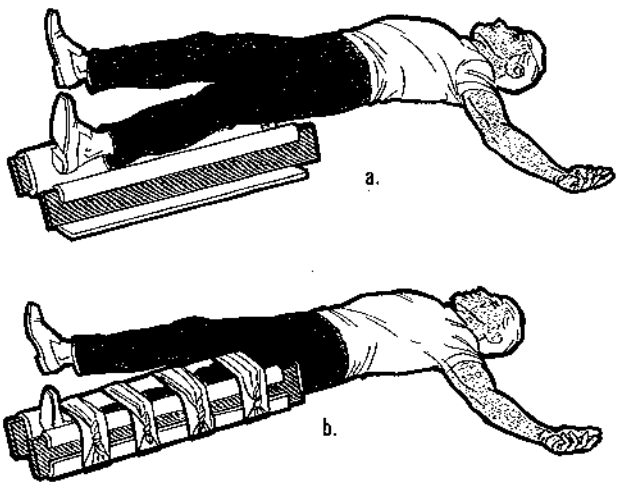


Fig. 3–47. Splinting fractures of tibia and fibula.

Treatment

The leg should be straightened carefully, using slight traction. (See Fig. 3–28.) A full leg, inflatable air splint may be applied, if available. (See Fig. 3–32.) The air splint will assist in controlling the bleeding, if there is a compound fracture. If other types of splints are used, three should be applied. A well-padded splint should be applied to each side of the leg, and another should be placed under the leg. The splints should extend from the middle of the thigh to beyond the heel. (See Fig. 3–47.)

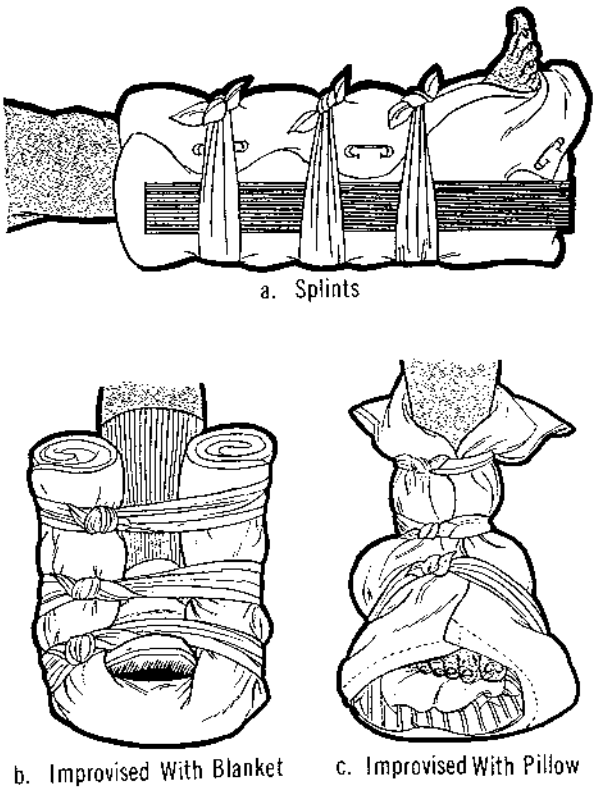


Fig. 3–48. Splinting fractures of ankle and foot.

For severe pain, morphine sulfate 10 mg may be given by intramuscular injection. To repeat the morphine sulfate, medical advice by radio should be obtained.

ANKLE AND FOOT

A fracture of the ankle or foot usually is caused by a fall, twist, or a blow. Pain and swelling will be present, along with marked disability.

Treatment

If available, a half-leg, inflatable air splint should be applied. If conventional splints are applied, the ankle should be well-padded with dressings or a pillow. The splints, applied to each side of the leg, should extend from the midcalf to beyond the foot. (See Fig. 3–48.)

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. Before repeating the codeine sulfate, medical advice by radio should be obtained.

TOE

A fractured toe usually is caused by a crushing injury or by kicking the foot against a hard object. There is pain and swelling, and a deformity may be present.

Treatment

If necessary, the injured toe can be bandaged to the next toe to provide support, or splinted with a tongue depressor.

For pain, aspirin 600 mg with codeine sulfate 30 mg should be given by mouth. If aspirin is not well tolerated by the patient, acetaminophen may be tried at the same dosage and frequency. To continue the codeine sulfate, medical advice by radio should be obtained.

- Abdomen
- Back
- Chest
- Ear
- Eye
- Head
- Neck
- Hand
- Genitalia

Chapter III

Emergency Treatment of Injuries

Section E

INJURIES TO SPECIFIC BODY AREAS

ABDOMINAL INJURIES

Open Wounds

A WOUND THAT PENETRATES the abdominal cavity is extremely dangerous because of possible damage to internal organs. The stomach or intestine may be perforated, internal bleeding may occur, and infection may develop. Bacteria may be introduced into the peritoneal cavity from the outside or from a perforated intestine.

Usually there is intense pain, severe shock, nausea, and vomiting; a spasm of the abdominal muscles may occur.

Treatment

As soon as possible, plans should be made to evacuate the patient from the ship to the nearest medical facility, because immediate surgical treatment generally is required.

The patient should be placed on his back. If the intestine is exposed or protruding, a pillow or bulky material should be put under his knees to relax the abdominal muscles. *No attempt ever should be made to push the protruding intestine back into the abdominal cavity, because of the danger of infection.*

The intestine should be covered with a sterile dressing that is dampened with sterile or cool, boiled water, or lactated Ringer's solution. The dressing should be large enough to cover the wound and surrounding skin, and should be held in place with a bandage. Care should be taken *not* to fasten the bandage so tight that it interferes with circulation. When the intestines are not protruding, a dry, sterile dressing may be applied to the wound.

The patient should be treated for shock (see p. III–9+). Morphine sulfate 10 mg intramuscularly may be given if the patient has no difficulty in breathing. To repeat the morphine sulfate, medical advice by radio should be obtained. *No fluids should be given by mouth* because surgery will be necessary as soon as the patient reaches a medical facility.

Closed Wounds

Closed wounds from severe blows or crushing injuries may be extremely dangerous. Serious injury to internal organs, internal hemorrhage, and shock may occur. Complications might develop within the first 48 hours that will be as serious as the immediate effects of the injury.

Treatment

Treatment for a closed wound should be the same as for an open wound, except for the application of a dressing.

BACK INJURIES

Treatment

Closed injuries to the spine are covered on p. III–37. These injuries usually are the result of falls, crushing accidents, and sharp blows across the back. Severe pain in the side, blood in the urine, muscle spasm, and shock may indicate an injury to a kidney.

Open injuries to the back usually are the result of stabbings, bullets, and flying debris from explosions. The treatment for an open wound should be followed for this type of injury. (See p. III–46.)

Medical advice by radio should be obtained, and plans should be made as soon as possible to evacuate the patient to a medical facility.

CHEST INJURIES

Sucking Wounds

Because of the lower internal pressure, an open wound into the chest cavity permits air to flow in and out as the patient breathes. (See Fig. 3–49.) This may cause the lung to collapse and fail to function. Also, there is a danger of internal hemorrhaging, if the lung, heart, or large blood vessels have been punctured. A sucking chest wound *always* should be suspected, when there is an open chest wound.

The patient may have increasing difficulty in breathing, blueness of the skin (cyanosis), faintness, dizziness, thirst, and a rapid pulse. If the lung, heart, or large blood vessels have been punctured, the patient may cough up frothy, bright red blood, have a weak pulse, faint heart sounds, and distention of the neck and arm veins. There may be a "sucking" or "hissing" sound as the air flows in and out of the chest cavity.

Treatment

The wound opening must be sealed off immediately. A large dressing of sterile gauze should be applied and the area sealed off with overlapping strips of 3-inch adhesive tape. (See Fig. 3–49.) If sterile gauze dressings are not available immediately, the palm of the hand could be used temporarily. The patient should be placed on the injured side so the uninjured lung can expand more freely. The patient can be treated for shock, if it occurs. (See p. III–9+.) An airway should be maintained and artificial respiration administered, as necessary. (See p. IV–1+.)

Medical advice by radio should be obtained for additional treatment; and as soon as possible, plans should be made to evacuate the patient from the ship to the nearest medical facility.

Protruding Objects

Treatment

Never remove the wounding object, if it is still in place. Fatal bleeding may occur if it is removed. Dressings should be placed around the object to immobilize it, and a bandage applied to hold the dressings in place. Artificial respiration should be provided if the patient is having

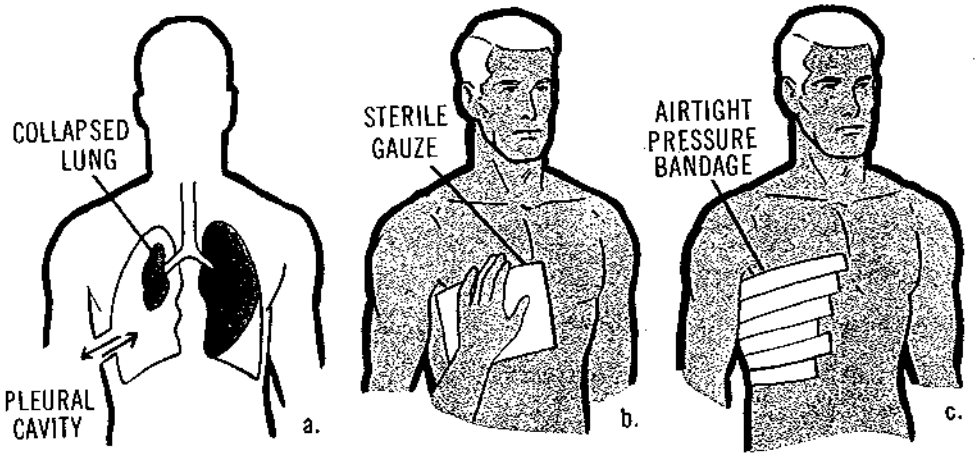


Fig. 3–49. Treatment of a sucking chest wound.

difficulty breathing, or is *not* breathing. (See p. IV–1+.) Treatment for shock should be given. (See p. III–9+.)

Medical advice by radio should be obtained, and plans should be made as soon as possible to evacuate the patient from the ship to the nearest medical facility.

Compression of the Lung

Blood, air, and other fluids may enter the chest cavity and compress the lung. *Immediate medical attention is necessary* and plans should be made as soon as possible to evacuate the patient to the nearest medical facility.

Treatment

The patient may have difficulty breathing. An airway should be established (see p. IV–1); and artificial respiration applied, if necessary. (See p. IV–1+.)

Crushing Injuries

These injuries usually result from vehicle accidents and falls. The severe pain from the injuries, often intensified by broken ribs, tends to cause the patient to restrict breathing. Also, the chest wall may collapse between the multiple fractures on each side of the chest (flail chest), which prevents an adequate amount of air to be exchanged.

Treatment

To make breathing easier, the patient should be placed in a comfortable position with the head and shoulders elevated. If the patient has a flail chest, the rib cage should be splinted. (See p. III–15.) Medical advice by radio should be obtained for additional treatment, and plans should be made to evacuate the patient to the nearest medical facility.

EAR INJURIES

Cuts and Lacerations

Cuts and lacerations of the ear occur frequently; and occasionally, a section of the ear may be severed. This section should be saved, placed in ice water, and sent to the medical facility with the patient. There, it may be sutured to the patient's ear.

Treatment

The treatment of these cuts and lacerations would be the same as for regular wounds. (See p. III–3+.) If there is excessive bleeding, direct pressure should be applied (see p. III–5+), and the bleeding controlled before the area is bandaged.

PERFORATION (RUPTURE) OF THE EARDRUM

An injury to the eardrum generally occurs as a result of a blow to the ear, explosion or blast, or a sudden change in the pressure on the ear, as from a dive into deep water. Also, an infection in the middle ear may cause the eardrum to rupture.

Treatment

The ear should not be tampered with and no instrument should be inserted into it. A small piece of cotton should be placed loosely into the ear canal to protect the injured area, until medical assistance can be obtained.

When the eardrum has been perforated as a result of a skull fracture, the flow of the cerebrospinal fluid should not be stopped. Also, nothing should be inserted into the ear canal because of the danger of causing a brain tissue infection. The patient should be placed on his injured side, with the shoulders and head propped up. This will allow the fluid to drain freely until medical assistance can be obtained.

EYE INJURIES

Emergencies

There are two ocular emergencies that require *immediate treatment* within seconds to minutes. They are chemical burns of the cornea (especially alkali burns) and closure of the central retinal artery.

Treatment

It is doubtful if anything can be done aboard ship to treat successfully the central retinal artery problem; but there is a possibility that the following measures may help. If a person complains of a sudden, complete or almost complete loss of vision in one eye, two things can be tried:

- Breathing and rebreathing into a paper bag may help to dilate retinal vessels due to the effect of carbon dioxide. Continue rebreathing the exhaled air from the bag for 15 minutes.

• Massage the eyeball through the closed eyelids with the fingers. Do this while the patient is breathing into the bag. There is a remote chance that by these measures, an embolus blocking the artery will move into the periphery of the retina.

Chemical Injuries

Treatment

Almost without exception, immediate first aid for a chemical injury to the eye is: *immediate gentle irrigation of the eye with large amounts of fresh clean water or a neutral fluid such as milk (at least two or three quarts).* Do *not* use boric acid solution. Sterile normal saline or 5% dextrose solution intended for intravenous administration can be used, when available. *Do not delay the irrigation to obtain these special solutions. Fresh clean water will do!*

Seconds count! The eyelids must be opened for irrigation. It may be necessary to use force to open the lids. However, care must be taken not to exert pressure on the eyeball if there is a penetrating injury. If a person is alone, the eye should be flushed over a fountain, in a shower, or under a faucet. The difference between retention of vision and possible future blindness can depend upon one's remembering to irrigate the eye gently with large amounts of fresh, cool water or milk.

After irrigation, homatropine hydrobromide 5% eye drops should be instilled into the injured eye. Then, antibiotic ophthalmic ointment should be applied and the eye covered with a dressing. For pain, acetaminophen 600 mg may be given by mouth alone or with codeine sulfate 30 mg, if necessary. To repeat the codeine sulfate, medical advice by radio should be obtained. The bandage should be changed daily. The patient should be evacuated immediately to the nearest medical facility. Corticosteroid drops should be used *only* on the advice of a physician.

Alkalis, such as sodium hydroxide (lye), ammonium hydroxide (ammonia), calcium hydroxide (slaked lime), toilet bowl cleaner, and other caustics cause many of the most serious chemical injuries to the eyes. *The eye should be irrigated immediately and medical advice by radio obtained.* The patient should be evacuated to the nearest medical facility, as soon as possible.

Acids, such as sulfuric acid, hydrochloric acid, chromic acid, superphosphate fertilizers and sulfur dioxide gas (forms sulfurous acid when dissolved in water), also can cause severe injury. Early medical attention is indicated after irrigation of the eye.

Petroleum products, such as crude oil, gasoline, kerosene, and naphtha may cause local irritation of the eye. Usually they do not cause severe ocular damage. The immediate treatment is the same as with chemical injuries. In minor cases, it only may be necessary to irrigate the eye thoroughly.

Other chemicals generally require the same irrigation treatment. If the chemical is harmful, usually the eye will become painful, red, and teary. If these symptoms do not occur immediately or are only slight, the substance in question probably is not very injurious to the eye.

In all cases of injury to the eye, it is useful to evaluate the visual acuity in the injured eye after irrigation and before instilling any medication. If an eye chart is not available, the patient should be asked to read a newspaper at 14 inches. If this is not possible, "counting fingers" vision, hand motion or perception should be evaluated. This will give some idea of the visual capacity of the injured eye. The patient should be asked:

• If light can be perceived through the injured eye.

• If hand motion can be seen in front of his face.

• If the number of fingers held in front of his face can be identified.

Foreign Bodies

Common foreign bodies include eyelashes, sand, soot, cinders, chips of rust, paint, and metal shavings. Sometimes a chip of steel may come off a steel chisel or hammer, and strike the eye with such speed that it punctures the eye like a bullet. The only symptom, other than mild irritation, may be severe loss of vision. *In such a case immediate medical attention must*

be obtained. Wearing safety glasses, whenever working with tools such as a chipping hammer or lathe, will help prevent such accidents.

Treatment

Most foreign bodies are flushed out of the eye by the large amount of tears produced by the irritation. However, sometimes the foreign body remains and must be removed. A small speck on the *conjunctiva* can be removed almost painlessly by irrigation, or by carefully lifting it up with the end of a moist, sterile, cotton-tipped applicator. *However, an attempt should not be made to remove a foreign body from the cornea with a dry unsterile cotton-tipped applicator.*

Foreign bodies on the cornea are often difficult to see and must be looked for carefully. A foreign body often lodges under the upper eyelid where it can be found by rolling back the lid and looking at its undersurface. Frequently, there is more than one foreign body in the eye at one time. When the foreign body is found, an attempt should be made to remove it by irrigating with a fine spray from a bottle of sterile eye irrigating solution. If the foreign body does not come off easily, it is best to patch the eye and try again in 12 to 24 hours. Medical advice by radio should be obtained for additional treatment.

The eye may remain somewhat irritated, even after the foreign body has been removed. The patient should be started on a course of polymyxin B - neomycin - gramicidin eye drops. (See p. VI–39.) Occasionally the patient will be more comfortable if the eye is patched with a sterile dressing for 24 hours.

Scratches, Cuts, and Abrasions

When a patient has rubbed something in his eye and injured it, the sensation of a foreign body (pain, redness, tearing) may be felt. Often in these cases a small scratch or abrasion has occurred on the cornea. Frequently this can be seen only when fluorescein is placed in the eye. The scratch or abrasion takes up the fluorescein and is outlined as brilliant green. (See p. VI–22.) It may be necessary to place a drop of anesthetic (proparacaine hydrochloride eye drops 0.5%) into the eye in order to examine for a scratch, cut, or abrasion. Do *not* use anesthetic ointments.

Treatment

The treatment for a scratch, cut, or abrasion of the eye consists of instilling polymyxin B-neomycin-bacitracin ophthalmic ointment and patching the eye. The bandage should be changed each day for two to three days. (Superficial abrasions and scratches of the cornea often heal overnight.) If the patient still is uncomfortable after this time period, medical care should be obtained.

A deep cut into the eye through the cornea and sclera is a severe injury. When this occurs, the inner portions of the eye may come out through the wound. These inner structures often look grey to black, and the anterior chamber may be filled with blood. These are very serious cases that require the immediate care of a skilled eye surgeon in order to save the eye. Two drops of the antibiotic polymyxin B-neomycin-gramicidin eye drops should be instilled immediately into the eye. The eye should be patched lightly, and emergency medical care obtained as soon as possible. *Do not exert pressure on the eyeball when opening the lids.* The contents of the eye might extrude if the wound extends through the cornea and/or sclera.

Contusions and Black Eyes

Severe contusions of the eyeball and extensive black eyes caused by blunt objects or fists should be seen by an eye physician on return to port, although the injured part may seem to be recovering satisfactorily. Damage to the lens or retina may be present and blow-out orbital fractures can occur without obvious clinical evidence.

Treatment

If a blood clot (hyphema) can be seen behind the cornea and in front of the iris when the patient is upright, the patient should be placed into bed with both eyes patched for six days. Bleeding may recur if ambulation is allowed following contusion hyphema, with secondary glaucoma resulting as a hazard to vision. Subconjunctival hemorrhages without other findings need no treatment.

Thermal Injuries to Eyes

Flame Burns

Flame burns to the eyes may be of three types:

- First-degree (superficial)—reddening of the skin without blistering.
- Second-degree—blistering of involved areas.
- Third-degree—charring and more complete destruction of the tissues.

Treatment

Superficial burns of the eyelids may be left open to the air. If the patient experiences mild pain, cold compresses often provide sufficient relief.

Second- and third-degree burns of the lids should be covered with a sterile, dry dressing, *if the patient is to be evacuated immediately.* Blisters should not be opened. Early treatment and skin grafting often are necessary in these cases to prevent permanent scarring and deformity.

If the patient is not to be evacuated immediately, the following treatment should be administered. Considerable pain and sensitivity to light may be present, so a drop of anesthetic such as proparacaine hydrochloride 0.5% eye drops placed in the eye may be required to permit examination. Involvement of the eyeball is indicated by marked redness of the conjunctiva, or greyness and even charring of the conjunctiva and cornea.

To prevent infection, polymyxin B-neomycin-bacitracin ophthalmic ointment should be placed in the eye and a sterile patch taped in place over the closed lid. Additional ointment should be placed in the eye daily and the dressing changed. Medical advice by radio should be obtained and systemic pain medications administered as prescribed.

Contact Burns

Treatment

Matchheads, hot cinders, and fly ash often strike the cornea and produce a localized grey or yellow cloudy area. Even the smallest corneal break or injury can cause severe pain and requires treatment similar to that for flame burns to prevent infection and permanent scarring.

Molten metal of low melting points, such as lead or solder, often form a mold on the front of the eye. Removal of the metal, treatment with polymyxin B-neomycin-gramicidin ophthalmic drops, and patching the eye often result in complete healing in two to three days. The eye should be examined and the bandage changed every day.

Scalds by hot fluids and steam should be treated as flame burns after irrigation of the eye. Large amounts of sterile water or mild eye irrigating solution should remove traces of such fluids as gasoline and oil. The eyeball itself rarely is affected due to the protection of the blink reflex. However, it should be examined in every case.

Welder's (Ultraviolet) Keratitis

The most common ultraviolet injuries are the result of gazing without dark goggles into a welding arc or the arc from an electrical short circuit. The ultraviolet light often can affect the eye, even if the patient does not look directly at the arc.

Initial symptoms first appear after 30 minutes to 12 hours, depending upon the intensity of the rays and the length of exposure. Patients generally report pain about the eyes, sensitivity to light, and/or a gritty, burning sensation.

Treatment

These patients should rest in a darkened room. Cold compresses should be placed on the eyes and forehead, and medication by mouth for pain may be required. Anesthetic eye drops such as proparacaine hydrochloride 0.5% should *not* be used except when necessary to examine the cornea. *In no case* should eye drops or ointment be given to the patient for pain during the recovery phase. Eye patches may be necessary for comfort during the first 24 hours.

With the above treatment, patients usually recover completely within 24 to 48 hours.

HEAD INJURIES

Scalp Injuries

Open wounds of the scalp are prone to bleed profusely, and the wound edges usually tend to gape. Also, dirt, hair, glass, soil, or other foreign matter, and bone fragments may be found in deep wounds.

Treatment

Minor wounds of the scalp should be treated like regular wounds. (See p. III–14.) If the skull is fractured, deep scalp wounds should not be cleansed because it may lead to serious bleeding or contamination of the brain tissues. Severe bleeding should be controlled by placing a sterile dressing on the wound. If a fracture is suspected, firm pressure should be applied, but *not* forcibly. Once the bleeding has been controlled, a bandage may be applied to hold the dressing in place.

For a severe wound or a suspected fracture, medical advice should be obtained by radio and plans made to evacuate the patient to the nearest medical facility as soon as possible.

Brain Injuries

An injury to the brain may be present in all head injuries. The extent of the injury may be estimated within limits by the severity of the symptoms.

An open skull fracture may be present with destruction of the covering membrane and brain tissues. For this type of injury, the risk of infection is very high, due to the probable contamination of the wound.

Immediately following a head injury, temporary loss of consciousness may occur, which may or may not indicate brain injury. However, when unconsciousness persists for a long period of time, some degree of brain injury probably has occurred. Also, a patient with this type of injury later may lose consciousness due to the progressive swelling of the brain within the skull.

Symptoms of brain damage, which may develop at any time before or after the initial unconsciousness, may include:

- Confusion which may persist for some time, then clear up, or develop into semiconsciousness, stupor, or deep coma.
- Paralysis or numbness of the limbs (opposite the side of the injury); and of the face (same side as the injury).
- Convulsions which may be general or local. (See p. V–78.)
- Difficulty in speaking.
- Excitement, restlessness, and occasionally delirium.
- Pupils of the eyes may be unequal in size.
- Watery, blood-tinged discharge from the patient's nose, ear canal, or mouth.
- Vomiting.
- Headache.
- Slow and full pulse which becomes fast and weak.
- Flushed or pale face.
- Loss of bladder or bowel control.

Treatment

Any patient with a suspected concussion, or other brain injury from either a major or a minor accident, should be watched carefully for 24 to 48 hours. Medical advice by radio should be obtained for specific treatment, and plans made as soon as possible to evacuate the patient to a medical facility.

The patient should be placed in bed, kept warm, and handled as little as possible. If a neck injury is *not* suspected, a pillow or a pad may be placed under the head and shoulders. *Never* place a pillow under the head only, because it may obstruct the airway. An open airway should be maintained, and the patient's head turned to the side, so secretions can drain from the mouth. Artificial respiration should be administered, as necessary. (See p. IV–1+.)

Bleeding should be controlled (see p. III–5+), and a sterile dressing applied. Although watery, blood-tinged cerebrospinal fluid may drain from the patient's ears or nose for several days following a skull fracture, *no* attempt should be made to insert gauze or cotton to stop the flow. However, the ear may be covered by a light, sterile dressing. The patient should be cautioned against nose blowing.

Ice bags may be applied to the head for pain. Morphine sulfate should *not* be given. Fluids should *not* be given by mouth except on the advice of a physician.

An accurate record should be kept of the extent and duration of unconsciousness, pulse rate, breathing rate, and the patient's progress.

Face and Jaw Injuries

Injuries to the face and jaw generally occur as a result of fights, falls, vehicle accidents, and other violent type accidents. Obstruction of the air passage with blood and other secretions is common and requires immediate treatment. Teeth may be loose, deformed, or missing. This type of patient may have difficulty opening and closing the mouth, speaking, and swallowing.

Treatment

An open airway should be established immediately (see p. IV–1+). Open wounds should be treated as regular wounds (see p. III–3+). *Unless a neck injury is suspected, a conscious patient without a neck injury* should be positioned to lean forward, so secretions can drain out. Sterile dressings should be applied. An *unconscious patient without a neck injury* should be turned toward the side with the head and shoulders elevated, to let secretions drain out. Treatment for shock should be given (see p. III–9+). Artificial respiration (see p. IV–1+) should be administered as required.

Nose Injuries

Nosebleeds may occur as a result of an injury, a disease such as hypertension (high blood pressure), exposure to high altitudes, and overactivity or strenuous exercise. Most nosebleeds are not serious and can be treated aboard ship.

If the nose is fractured, the patient should be evacuated to a medical facility. Unless the broken parts are positioned properly, distortion of the nasal bones may result in difficulty in breathing.

Treatment

When treating a nosebleed, the patient should be in a sitting position, leaning forward. If the patient cannot lean forward, and must lie in a reclining position, the head and shoulders should be raised. Pressure should be applied to the bleeding site, and cold compresses applied to the face and nose. If the bleeding continues, a small gauze dressing should be placed in the nostrils and pressure applied. *Always* leave a corner of the dressing protruding from each nostril, so it can be removed easily. The patient should remain quiet, and avoid blowing the nose for an hour after the bleeding has ceased. If the bleeding cannot be controlled, medical advice by radio should be obtained for additional treatment.

Mouth Injuries

Treatment

Small wounds of the lips, tongue, and cheeks usually heal quickly without serious infection. Large lacerations and gaping wounds will require suturing. Plans should be made as soon as possible to evacuate the patient from the ship to the nearest medical facility.

If there is bleeding, it can be controlled by direct pressure (see p. III–5+) with a sterile gauze dressing. When there is a small wound, the mouth should be rinsed well with sodium bicarbonate mouthwashes several times a day. Good oral hygiene must be maintained. (See p. V–18 for the treatment on loss of a tooth.)

NECK INJURIES

Treatment

Because the jugular veins are on each side of the neck, plus other deeper major arteries and veins, lacerations and puncture wounds can be extremely serious. If one of these blood vessels is damaged, direct pressure must be applied immediately, and maintained until the patient is seen by a physician. *This patient must be evacuated immediately to save his life.* A small wound would be treated as a regular wound. (See p. III–3+.)

If pressure is applied forcibly to the throat, or if the throat is struck by a blunt force—collapse, swelling, or a serious spasm of the larynx may occur. Artificial respiration should be administered immediately (see p. IV–1+). An oropharyngeal tube should be inserted, if necessary (see p. III–23). The patient's head and shoulders should be elevated if there are no suspected fractures of the back or neck. If the condition appears serious, plans should be made as soon as possible to evacuate the patient to the nearest medical facility for treatment of a possible fractured neck.

HAND INJURIES

Treatment

Minor wounds to the hand are common and should be treated as regular wounds. (See p. III–3+.) If there has been a crushing type of injury and a fracture is suspected, the hand should be treated for a fracture. (See p. III–36.)

Extensive wounds should not be cleansed. A roll of gauze or fluffed-up gauze dressings should be applied over the injured area, and a pressure bandage applied (see p. III–6) to control the bleeding. Then the arm should be placed in a sling and elevated above the level of the heart to reduce the swelling. If the patient is on his back, pillows should be placed under the hand to elevate it.

For additional treatment, medical advice by radio should be obtained. Plans should be made as soon as possible to evacuate any patient with an extensive wound or fracture of the hand to the nearest medical facility.

GENITAL INJURIES

Injuries to the genitalia usually are the result of kicks, blows, falling astride rails or similar objects, machinery accidents, and being struck by flying missiles. Severe pain, faintness or fainting, considerable swelling and bleeding usually occur. If the urethra or bladder is damaged, urine and blood will leak into the injured area. Severed tissue should be saved, placed in ice water and sent with the patient to a medical facility.

Treatment

Bleeding should be controlled by direct pressure. (See p. III–5+.) To ease the pain and reduce the swelling, the patient should be placed in bed with cold compresses applied to the injured area. The patient should be treated for shock, as necessary. If there is an open wound, a dressing should be applied. (See p. III–10+.) Medical advice by radio should be obtained, if the injury appears serious.

- **Cold Exposure Injuries (Local)**
  Chilblain
  Immersion Foot and Trench Foot
  Freezing Injuries (Frostbite)
- **Cold Exposure Injuries (General)**
- **Heat Exposure Injuries**
  Heat Exhaustion
  Heat Cramps
  Heatstroke

Chapter III

Emergency Treatment of Injuries

Section F

COLD AND HEAT EXPOSURE EMERGENCIES

COLD EXPOSURES INJURIES (LOCAL)

COLD INJURIES TO PARTS of the body (face, extremities) are caused by exposure of tissues and small surface blood vessels to abnormally low temperatures. The extent of the injury depends upon such factors as temperature, duration of exposure, wind velocity, humidity, lack of protective clothing, or the presence of wet clothing. Also, the harmful effects of exposure to cold are intensified by fatigue, individual susceptibility, existing injuries, emotional stress, smoking, and drinking of alcoholic beverages.

Cold injuries to parts of the body are broken down into *Chilblain, Immersion Foot, Trench Foot,* and *Frostbite.* These are descriptive terms which indicate the way the injury occurred.

Chilblain

This relatively mild form of cold injury occurs in moderately cold climates with high humidity and temperatures above freezing, 32°F to 60.8°F (0°C to 16°C). Chilblain usually affects the back of the hand; but it may affect the lower extremities, especially the anterior tibial surface of the legs.

It is characterized by a bluish red appearance of the skin and a mild swelling often associated with an itching, burning sensation which may be aggravated by warmth. If the exposure is brief these manifestations may disappear completely with no remaining signs. However, intermittent exposure results in the development of chronic manifestations, as increased swelling, deep reddish purple discoloration of the skin, blisters, and bleeding ulcers which heal slowly to leave numerous pigmented scars.

Treatment

For skin discomfort, apply a bland soothing ointment such as petrolatum. People susceptible to chilblain should avoid the cold or wear wool socks and gloves.

Immersion Foot and Trench Foot

These two forms of local cold injuries are related.

Immersion foot occurs by exposure of the lower extremities to water at above-freezing temperatures, usually below 50°F (10°C), in excess of 12 hours. This characteristically occurs among shipwrecked sailors existing on

lifeboats or rafts with a poor diet, inactivity, dependency of the legs, constricting clothing, wet clothing, and adverse weather circumstances. Clinical manifestations include swelling of the feet and lower portions of the legs, numbness, tingling, itching, pain, cramps, and skin discoloration.

Trench foot occurs at above-freezing temperatures, usually below 50°F (10°C). It generally happens in a damp environment in connection with immobilization and restriction of the extremities.

Treatment

In cases of Immersion Foot and Trench Foot uncomplicated by trauma there usually is no blistering or tissue destruction. One should prevent continued exposure and apply petrolatum for skin discomfort.

Freezing Injuries (Frostbite)

This is the term applied to cold injuries where there is destruction of tissue by freezing. It is the most serious form of local cold injury. Although the area of frozen tissue usually is small, a frostbite may cover a considerable area. Fingers, toes, cheeks, ears, and nose are the most commonly affected body parts. If the exposure is prolonged, the freezing may extend up the arms and legs. Ice crystals in the skin and other tissues cause the area to appear a white or greyish-yellow color. Pain may occur early and subside. Often, the part will feel only very cold and numb, and there may be a tingling, stinging, or aching sensation. The patient may not be aware of frostbite until someone mentions it. When the damage is superficial, the surface will feel hard and underlying tissue soft when depressed gently and firmly. In a *deep,* unthawed frostbite the area will feel *hard,* solid, and cannot be depressed. It will be cold and numb, and blisters will appear on the surface and in the underlying tissues in 12 to 36 hours. The area will become red and swollen when it thaws and later gangrene will occur and there will be a loss of tissue (necrosis). Time alone will reveal the kind of frostbite that has been present. It is fortunate therefore that the treatment for various degrees of frostbite is identical except for superficial frostbite. *A frostbite of the superficial dry freezing type should be thawed immediately to prevent a deepfreezing injury of the part involved. However, never thaw a frozen extremity until arrival at a facility with water, heat, and equipment where the extremity can be rewarmed rapidly.*

Treatment

All freezing injuries follow the same sequence in treatment: first aid, rapid rewarming, and care after first aid.

First Aid

The principles of first aid in local cold injury are relatively few. The two most important aspects are getting the patient to a place of permanent treatment as soon as possible, and then rewarming. It is important to note that a patient can walk for great distances on frostbitten feet with little danger. Once rewarming has started, it must be maintained. All patients with local cold injuries to the lower extremities become litter cases. Refreezing or walking on a partially thawed part can be very harmful. During transportation and initial treatment, the use of alcoholic beverages should not be permitted, because they affect capillary circulation and cause a loss of body heat. Ointments or creams should not be applied.

Rapid Rewarming

The technique of rewarming has two phases: (1) the treatment of exposure; and (2) the treatment of the local cold injury. *Treatment of exposure* consists of actively rewarming the general patient. This is done in principle by the removal of cold and the addition of warmth. *Removal of cold* is accomplished by removal of all cold and wet clothing and constricting items, as shoes and socks. *Addition of warmth* is provided from external and internal sources. External warmth is accomplished by providing the patient with prewarmed clothes and blankets. Giving a patient a cold change of clothes, a cold blanket, or a cold sleeping bag will cause a rapid dissipation of his residual heat. If necessary, it would be better to have someone donate the clothing that he is wearing to the patient. Someone should warm the sleeping bag prior to the patient's entrance into it. A good source of warmth is the body heat of other people. In general, in-

ternal warmth is provided by hot liquids and an adequate diet.

There are two techniques of *rapid rewarming:* wet and dry.

Wet rapid rewarming which is preferred is accomplished by completely immersing the local part in an adequate amount of water at a temperature between 104°F and 107.6°F (40°C and 42°C). The water bath should be tested frequently with a thermometer. If one is not available, some of the water should be poured over the inner portion of the wrist to make sure the water is not too hot. Warming should be discontinued when the part becomes flushed, usually within 20 minutes with the wet method. Further rapid wet rewarming is not necessary.

The dry rapid rewarming technique takes three to four times as long as the wet technique, and is best accomplished by the use of natural body warmth as exemplified by putting the patient's hands in another person's axilla or sharing warm clothing. Also, the patient can be exposed to warm room air.

Do not walk such a patient nor massage a body part. Do not use water hotter than 111°F (44°C), nor recool with ice or snow and do not expose the extremity near an open flame or fire.

Care After First Aid

After the rewarming of a cold injury of a lower extremity, the patient is treated as a litter case. All constricting clothing items should be removed, total body warmth should be maintained, and sleep should be encouraged.

After rewarming, the part should be cleansed carefully with povidone-iodine skin cleanser and water, or soap and water, taking care to leave the blisters intact. Sterile fluff dressing should be applied. Dry, sterile gauze should be placed between toes and fingers to keep them separated. The patient should be placed in bed with the affected part elevated and protected from contact with the bedding. If available, a bed cradle can be used, or one can be improvised from boxes to keep sheets and blankets from touching the affected area. Additional heat should *not* be applied.

Morphine sulfate 10 mg should be given intramuscularly for pain and repeated every four hours as needed, *only if medical advice by radio recommends it.*

Caution: Morphine sulfate is a dangerous depressant of respiration. After receiving a dose the patient must be watched for shallow or very slow breathing. If this occurs, mouth-to-mouth resuscitation should be given. (See p. IV–1+.)

Medical advice by radio must be obtained for additional treatment. As soon as possible, the patient should be evacuated from the ship to the nearest medical facility.

COLD EXPOSURE INJURIES (GENERAL)

For discussion of generalized hypothermia due to acute, wet cold from total immersion see p. VIII–3.

HEAT EXPOSURE INJURIES

Heat Exhaustion

(Heat Prostration, Heat Collapse)

Exhaustion or collapse in the heat is caused by excessive loss of water and salt from the body. It occurs commonly among persons working in hot environments such as furnace rooms, bakeries, and laundries, or from exposure to hot, humid heat while outdoors. The circulation to such vital organs as the heart and brain is disturbed by the pooling of blood in the capillaries of the skin in order to cool the body. The capillaries constrict to compensate for this deficient blood supply, so the patient's skin appears pale and clammy. (See Fig. 3–50.)

Weakness, dizziness, nausea, dim or blurred vision, and mild muscular cramps may signal the attack. There is profuse sweating. The pulse will be fast and weak, the pupils dilated, and the respirations rapid and shallow.

Treatment

To improve the blood supply to the brain when fainting has occurred or seems likely to occur, the patient should be placed in a sitting position with the head lowered to the knees. Then, the patient should be placed in a reclining position with all tight clothing loosened. Sips of cool water containing one teaspoonful of table salt per glass should be given orally;

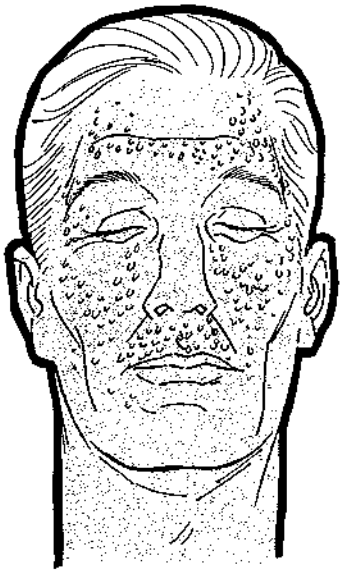


Fig. 3–50. Facial appearance in heat exhaustion.

Fig. 3–51. Facial appearance in heat stroke.

approximately one-half glassful should be given every 15 minutes for an hour. If the patient vomits, fluids by mouth should be stopped. If oral fluids are discontinued and the patient is in a deep state of collapse, sodium chloride injection 0.9% should be given intravenously. Medical advice by radio should be obtained.

The patient should be instructed to remain off work for several days, and to avoid exposure to excessively high temperatures during that time.

Heat Cramps

(Stoker's, Miner's, or Fireman's Cramp)

Heat cramps is a condition that affects individuals working in high temperatures. The severe pain and spasms of the abdominal or skeletal muscles occur as a result of profuse sweating and a failure to replace the salt loss. The cramps usually are more severe when the individual has been drinking large amounts of fluids without replacing the salt.

The cramps begin suddenly and occur most frequently in the muscles that bend the arms and legs. The patient may be lying down with the legs drawn up, while crying out from the severe pain. The skin may be pale and wet, the blood pressure remains normal, and the rectal temperature runs about 98°F to 100°F (36.6°C to 37.7°C). Usually there is no loss of consciousness. Although an untreated attack may last for hours, the condition is not considered dangerous.

Treatment

The patient should be moved to a cool place and given water with one teaspoonful of table salt added to each glass. A half glass of the salt water should be given initially; and repeated every 15 minutes for an hour, or until the symptoms are relieved. Manual pressure to the muscle or massage may help to relieve the cramp. If a more serious problem seems to be present, medical advice by radio should be obtained for patients with heat cramps.

Heatstroke *(Sunstroke)*

Heatstroke is a medical emergency that is associated with a potentially high mortality rate. *Heat exhaustion* may be regarded as the end result of overactive heat balance mechanisms which are still functioning. *Heatstroke* results when the body's heat regulatory activities are *not* functional, and the main avenue of heat loss (evaporation of sweat) is blocked. There may be early warning symptoms of headache, malaise, and excessive warmth, or a general picture of heat exhaustion. The onset usually is abrupt with sudden loss of consciousness,

convulsions, or delirium. Sweating is absent in the typical case; and inquiry frequently reveals that this was noted by the patient prior to onset of the other symptoms.

On physical examination the skin is hot, flushed, and dry. (See Fig. 3–51.) In severe cases, tiny rounded hemorrhage spots (petechiae) may appear. Deep body temperature is high, frequently in excess of 106°F (41°C). A rectal temperature above 108°F (42.2°C) is not uncommon, and indicates a poor outlook (prognosis) for the patient's future. The pulse will be rapid and strong, and may go up to a count of 160 or more. Respiration may be rapid and deep, and the blood pressure elevated slightly. The pupils of the eyes first will contract, then dilate. Muscular twitching, cramps, convulsions, and projectile vomiting may occur, and may be followed by circulatory collapse and deep shock.

Due to the extreme seriousness of heatstroke, all members of the vessel's crew should be taught the importance of recognizing cessation of sweating, so that corrective measures can begin at an early reversible stage.

Treatment

Immediate treatment for heatstroke must be given to reduce the body temperature, or brain damage and death may occur. The patient should be undressed and placed in a tub of cold water; or covered with continuous cold packs such as wet blankets; or sponged with cold water until the temperature drops. The temperature should be taken every 10 minutes, and not allowed to fall below 101°F (38.3°C). The skin should be massaged during this procedure to prevent constriction of the blood vessels, to stimulate return of the cooled blood to the overheated brain and other areas, and to speed up the heat loss. After the body temperature has dropped, the patient should be placed in bed in a cool room with a fan or air conditioner blowing toward the bed. If the body temperature starts to rise, it will be necessary to begin the cooling procedure again. Do *not* give the patient morphine sulfate, epinephrine, or stimulants. *Sedatives are given only to control convulsions.* The patient should be kept on bed rest for several days, and cautioned against later exposure to heat.

Chapter III

Emergency Treatment of Injuries

Section G

POISONING

EMERGENCY AID FOR POISONINGS

It is a MEDICAL EMERGENCY when anyone swallows a poison! Every *non-food substance* should be considered a potential poison!

What To Do First

1. Try to determine the probable poison and the amount swallowed. Carefully assess the patient's condition.
2. If the poison container is available, read the label for *ingredients* of the poison.
3. Use the radio for medical advice on further treatment.
4. While waiting for medical advice by radio, provide the treatment stated below.
5. Keep the patient warm.

Swallowed Poisons

Make the patient vomit . . . but *remember* there are conditions in which the patient should NOT be made to vomit.

1. Do NOT make the patient vomit when:

- The patient is unconscious or convulsing.
- The poison swallowed is a strong corrosive, such as acid or lye.
- The swallowed poison contains kerosene, gasoline, lighter fluid, furniture polish, or other petroleum distillates, unless instructed to do so by radio.

(*Exception:* if these are mixed with dangerous insecticides, then the poison must be removed.)

2. Directions for making the patient vomit:

- Give two tablespoonfuls (30 ml) syrup of ipecac. Follow this with one to two cups of water. If no vomiting occurs after 20 minutes, this dose may be repeated one time only. To stimulate vomiting, gently tickle the back of the throat with a spoon or similar blunt object.

3. Administration of activated charcoal:

- Activated charcoal (two to four tablespoonfuls in a glass of water) may be given after vomiting has occurred or if ipecac has failed to cause vomiting within an hour. Do not give activated charcoal before ipecac has had an opportunity to cause vomiting.

Poison Contact of Eyes or Skin

- Wash or flush thoroughly with water.

When Poison is Inhaled

- Remove the patient from exposure to fumes.
- Support respiration.

Important

- ***Under no circumstances should liquids be given to a patient who is unconscious or convulsing!***

INTRODUCTION

Poisoning usually occurs as a result of inhaled or swallowed poisons. Certain chemicals, particularly insecticides, can be absorbed by the skin and cause poisoning. The treatment of inhaled noxious gases (as carbon monoxide) is discussed on p. IV–20. Many organic solvents found in paint thinners and cleaning solvents may cause poisoning by inhalation. These should be used in well-ventilated areas. Persons overcome by fumes of solvents should be removed to fresh air. The treatment of poisoning by insecticides that can be absorbed by the skin is discussed on p. III–66.

Often poisons are swallowed accidentally. *Never* store poisonous substances with foods or medicines. *Never* store poisons in discarded food or medicine containers. Poisons in mislabeled containers have been confused with food substances and used in cooking with lethal results.

Poisoning may be confused with other medical emergencies. Poisoning should be suspected in sudden, severe illness associated with violent vomiting, diarrhea, severe abdominal pain, and physical collapse with subsequent unconsciousness. Prolonged, deep sleep from which the individual cannot be aroused, or can only be partially aroused, may indicate poisoning. The patient should be examined for stained or burned areas on the lips and on the inside of the mouth. The breath may help to diagnose a poisoning, as well as identify the poison through its characteristic odor. A careful check of the individual's room, or place where he was found, may reveal a container from which a poison was taken.

GENERAL PRINCIPLES OF TREATMENT

Too much antidote,* sedative, or stimulant often does more damage than the poison itself. It is important that good judgment plus a calm attitude should prevail when drugs or therapeutic measures are administered.

See p. III–60 for a ready reference chart entitled, *Emergency Aid for Poisonings.*

Give symptomatic treatment, first aid (as artificial respiration, CPR) and, as indicated, diazepam, 5 to 10 mg injection for excitement or convulsions.

Give supportive treatment, such as keeping the patient warm and comfortable, and administering oxygen if indicated.

In all cases, seek medical advice by radio.

Identify the poison as soon as possible. The label on the container may give the ingredients and may list specific antidotes.

If the poison was taken by mouth, *quickly remove the unabsorbed poison from the stomach.* Many poisons are emetics and cause vomiting. If this does not occur spontaneously, vomiting should be induced provided there are no special circumstances that make it unadvisable. *Do not induce vomiting* if the patient has taken a corrosive (acid or alkali), strychnine, and petroleum distillates; or if the patient is unconscious or convulsing.

Vomiting may be induced by giving the patient syrup of ipecac in a dose of two tablespoonfuls (30 ml) followed by one or two glasses of water. If vomiting has not occurred in 20 to 30 minutes, this dose should be repeated.

Do not give syrup of ipecac at the same time that activated charcoal (a general antidote) is given because the activated charcoal will render the ipecac ineffective. The activated charcoal may be given after the patient has vomited, or 20-30 minutes after the last dose of syrup of ipecac. If vomiting does not occur after administering syrup of ipecac, gastric lavage should be started at once. (See p. III–62 for instructions.)

GENERAL ANTIDOTE

If ipecac is not to be used, or if it has failed to work, give two to four tablespoonfuls of activated charcoal (a general antidote) mixed into a glass of water. Activated charcoal is safe to use, and will bind a large number of poisons, preventing them from being absorbed into the body. *Do not use the Universal Antidote**

* An *antidote* is a substance which neutralizes (counteracts) the effects of a poison or prevents its absorption.

* The *Universal Antidote*, a mixture of tannic acid, charcoal, and magnesium oxide, formerly considered a general antidote, should not be used because it is not effective.

GASTRIC LAVAGE (Stomach Washing)

Gastric lavage is a method used to withdraw some poisons from the stomach. Water or other lavage solutions are introduced into the stomach by means of a tube. Then the contents of the stomach are withdrawn through the tube and the washings are continued until the stomach is free from poison. The procedure is explained below.

Gastric lavage may be lifesaving, especially (1) if done within three hours after the ingestion of a poison; (2) if the patient did not vomit; or (3) if slowly absorbed drugs or poisons were ingested. *In most cases, vomiting induced by syrup of ipecac is preferable to gastric lavage. Gastric lavage or induced vomiting should not be used for the ingestion of strychnine and corrosive agents, as lye or mineral acids.*

Equipment

- Stomach tube
- Funnel
- Large pitcher (for irrigating solution)
- Large container for the return flow
- Cut strips of adhesive tape

Instruction

Explain the gastric lavage procedure to the patient. Wet the stomach tube before passing. The tube is best passed when the patient sits up with his head slightly forward. Pass the moist tube through the nose by gently pushing in a back and downward direction. Have the patient swallow continuously as the tube is passed, and instruct him to breathe deeply through his mouth. If the head is held slightly forward, swallowing is easier and the tube is passed more readily.

The following procedure should be used to make sure that the tube has not accidentally entered the trachea. Look into the back of the patient's mouth to determine that the tube passed down the throat. Before instilling any solution or antidote, the end of the tube should be placed in water. *Remove the tube at once if there is any bubbling, because the trachea (windpipe) has been entered, instead of the stomach. Usually coughing will signal any entrance into the trachea.* If neither bubbling nor coughing has occurred, continue passing the tube until it is inserted about 18 inches. The tube usually is marked about 46 cm (18 inches) from the gastric end.

The tube should be taped to the patient's nose to prevent it from slipping out of the stomach. The patient should be lying on his left side. Before pouring a large volume of any solution into the tube, always make a final check with a few drops of water to make sure that the tube is placed properly into the stomach. Attach the funnel to the end of the tube, hold the tube and funnel even with the patient's head, and pour a few drops of water down the tube. If this small amount of water does not cause the patient to cough, the tube most likely is in the stomach. However, if violent coughing occurs, the tube probably is in the trachea *and should be removed and reinserted as described in previous paragraphs.*

If the water does not cause the patient to cough, the tube should now be in the stomach properly placed to receive a larger volume of solution. Next pour the solution into the funnel. About a pint of water should be instilled into the tube. Do not allow the tube to empty of solution as this causes air to enter the stomach. The tube should be closed with the fingers or a clamp, when the last amount of solution from the funnel has been administered. Lower the tube and funnel below body level, invert, and allow the stomach contents to siphon out. This procedure should be carried out 10 or 12 times; or until the return fluid is clear. A record should be kept of the amount instilled into the stomach and the amount siphoned off.

TREATMENT OF SPECIFIC POISONINGS

Unfortunately, it may be very difficult to identify a specific poison without elaborate chemical tests. Not all poisons have a specific antidote. For treatment, poisoning may be divided into several types with similar prominent symptoms. General measures are applicable for the treatment of most types of poisonings. However, better results will be obtained if the cause of the poisoning can be classified into a specific group.

In general, poisons may be classified as follows:

Inhaled Carbon Monoxide and Other Noxious Gases

(See p. IV–20+.)

Caustic or Corrosive Poisons

(Acids, Alkalis, and Iodine)

These poisons may produce burns and pain in the mouth, throat, or abdomen; vomiting; diarrhea which becomes bloody and contains mucus; and swelling in the throat may block breathing passages.

Treatment

Acids (as Mineral Acids, Phenol) and Alkalis (as Lye, Ammonia)

The stomach should *not* be washed out and vomiting should *not* be induced. Large amounts of milk or water should be given by mouth as soon as possible. If a poison containing oxalic acid was taken, tetany (convulsions) from hypocalcemia might occur. Medical advice by radio may include intravenous calcium gluconate, 10% (10 ml ampul) to counteract the tetany (convulsions). It should be given very slowly until the convulsions are controlled. After the initial treatment, *medical advice by radio should be sought.* After poisoning by either alkalis or acids, the patient should be advised to have an esophageal examination by a physician at the earliest opportunity. (Also, see Chemical Burns, p. III–25.)

Iodine (as Tincture of Iodine or Lugol's Solution)

Starch water should be given immediately by mouth. Starch water is made by adding enough cornstarch or flour to water to make a thin mixture. If a large quantity of the poison were ingested, gastric lavage with starch water should be performed and arrangements made for immediate evacuation. Povidone-iodine, an organically bound, iodine complex, is relatively non-corrosive as compared to the elemental iodine preparations. Starch water or milk, taken orally, is used to treat ingestions of povidone-iodine.

Petroleum Distillates

(as Gasoline and Mineral Spirits)

A severe chemical pneumonia may occur if petroleum distillate is aspirated into the lungs. Although depression of the central nervous system is rare in adults, it may occur if four ounces or more of any petroleum distillates were taken.

Treatment

Large quantities of milk should be administered, and medical advice by radio sought immediately. If the patient experiences difficulty in breathing (possible chemical pneumonia), preparations should be made to give oxygen.

Central Nervous System Depressants

(as Barbiturates, Tranquilizers, Sedatives, and Alcohol)

Various preparations of these central nervous system depressants have been given descriptive synonyms by users which include the following, among others: knockout drops, downers, and sleeping pills. (See p. V–76.)

These depressants affect the nervous and cardiovascular systems. Excitement and hallucinations may precede the depression, which varies from stupor to coma. Respiration decreases, blood pressure falls, urine output decreases, and shock may occur.

Treatment

If there is difficulty in breathing, oxygen should be administered. Artificial respiration should be administered if breathing has stopped. (See p. IV–1.) If the patient is conscious, induce vomiting unless the patient is very drowsy. Stimulants (such as caffeine or amphetamines) should not be used. If coma or stupor occur, medical advice by radio should be obtained.

Narcotics

(as Morphine, Meperidine, Codeine, Paregoric)

The drug propoxyphene is included in this group. Although it is not classified as a narcotic, the treatment is the same.

Respiratory arrest is the main cause of death with these compounds. Some of the symptoms of poisoning are drowsiness, respiratory depression, convulsions, and coma.

Treatment

Naloxone, a narcotic antagonist given by injection, is the specific antidote for treating respiratory depression in poisoning by narcotics. (See p. VI–33.) Oxygen and artificial res-

piration should be administered, if respiratory difficulties develop. Obtain medical advice by radio.

Stimulants

(as Amphetamine, Cocaine)

Various preparations in this group have been given descriptive synonyms which include the following: bennies, speed, meth, uppers, and snow.

These are central nervous system stimulants. Effects from an overdose include excessive activity, frenzied excitement, exaggerated reflexes, tremors, fever, dilated pupils, and sweating. Sometimes coma and convulsions, elevated blood pressure, very rapid heart action, and irregular heart beat will occur. These patients often display aggressive behavior and feelings of persecution, and are capable of violent action.

Treatment

Actions that might be interpreted as antagonistic should be avoided and one should remain calm while talking to the patient. Diazepam 5 to 10 mg may be given intramuscularly every 4 hours, for sedation. Medical advice by radio should be obtained on the dosage and frequency of medication.

Antihistamines

(as Cyclizine, Diphenhydramine)

Symptoms of poisoning with these drugs are lethargy or drowsiness, followed by coma. Some patients exhibit excitation, nervousness, and convulsions.

Treatment

If the patient is conscious, induce vomiting unless the patient is very drowsy. If respiratory difficulties develop, oxygen and artificial respiration should be given. If convulsions occur, the treatment given on p. V–78 should be followed. Medical advice by radio should be obtained for additional treatment.

Hallucinogens

(as LSD, Peyote)

These chemicals cause intense visual and auditory hallucinations, alterations of body image, and an exaggerated sense of comprehension. The physical effects include dilated pupils, lack of coordination, numbness, tingling sensations, nausea, and sometimes vomiting.

Treatment

Rest, reassurance, sympathy, and support often are the best treatments. If there is a compelling need for sedation, diazepam 5 to 10 mg should be given intramuscularly every 4 hours. Depending upon the patient's response, a larger dose may be indicated on subsequent injection. A physician should be contacted by radio for advice.

Cyanides

Hydrogen cyanide or hydrocyanic acid (HCN) is a colorless liquid which boils at 77° to 78.8°F (25° to 26°C). It exists under ordinary conditions as a gas which is lighter than air. Hydrogen cyanide has a characteristic odor of "peach pits." The cyanides (the acid and its salts) are deadly to most living things. Hydrocyanic acid gas is one of the most effective fumigants available for vessels, but its use is extremely hazardous and it must be handled by specially trained individuals. Suicides and homicides account for most fatal cyanide poisonings but vessel fumigation has contributed a number of cases.

Hydrocyanic acid gas is absorbed readily through the lungs, the gastrointestinal tract, and the intact skin. Because of very rapid absorption, hydrocyanic acid gas exerts its toxic effects at once. Persons overcome by the gas may die very rapidly (within a few minutes) from respiratory failure. If removed within minutes from a sublethal exposure they will recover completely within a relatively short time.

Symptoms and signs develop very rapidly in cyanide poisoning. If the victim has been exposed to lethal amounts of hydrocyanic acid gas, the principal manifestation may be respiratory stimulation. The sequence of symptoms include immediate unconsciousness, convulsions, and death within a few minutes.

See p. XI–10, on preventive measures which should be taken to avoid exposure to toxic gas hazards aboard ship.

Inhaling or absorbing hydrocyanic acid gas through the skin in an amount close to a lethal dose causes a marked respiratory distress, dizziness, headache, nausea, vomiting,

drowsiness, irritated and scratchy throat, drop in blood pressure, rapid pulse, and unconsciousness. The odor of "peach pits" in the room or from the vomitus helps confirm a cyanide poisoning.

When taken orally, sodium cyanide, potassium cyanide, and other salts of hydrocyanic acid may give rise to acute or subacute poisonings with the above symptoms. With a lethal dose of a cyanide salt (for an adult about 250 mg), death occurs suddenly with or without convulsions.

It is important to know that workers handling cyanides may develop a rash which first occurs around the wrists, hands, and fingers associated with moderate scaling of the skin and itching which later may spread to all regions of the body.

Treatment

The emergency measures to follow for poisoning from hydrocyanic acid gas are:

- Quickly remove the victim into fresh air that is free of poison.
- Give amyl nitrite inhalation 0.2 ml every five minutes. This administration should be discontinued if the systolic blood pressure goes below 80 mm of mercury.
- Give oxygen and artificial respiration *other than* mouth-to-mouth resuscitation. *Mouth-to-mouth resuscitation can poison the rescuer.* (See p. IV–1+.)

Emergency measures for a person who has ingested a cyanide salt such as potassium cyanide, should include amyl nitrite inhalation, artificial respiration (*not mouth-to-mouth*), and oxygen. (Same as for the gas.) However, the ingestion of a cyanide salt is usually with suicidal or homicidal intent. Because of the rapid absorption of the cyanide, one can anticipate that a victim poisoned by cyanide probably will expire within the first 30 minutes. However, if the victim survives for four hours or more, there should be full recovery.

Medical advice by radio should be obtained promptly as to whether a physician should be put aboard ship, or the victim evacuated to a medical facility for follow-up care.

Methanol

(as Methyl Alcohol, Wood Alcohol, Columbian Spirit)

This poison is found in some paints, varnishes, paint removers, and "canned heat." A fatal dosage for methanol is between two and eight ounces.

The symptoms of poisoning by wood alcohol are the same as those for the depressants of the central nervous system (see p. V–73). Also, there may be headache, nausea and vomiting, gastric pain; visual disturbances, eye pain, sudden blindness; acidosis; coma; and death from respiratory or circulatory failure.

Treatment

For methanol poisoning vomiting should be induced, followed by gastric lavage with two tablespoonfuls of sodium bicarbonate per liter (quart) of solution. Then, three to four ounces of whisky should be given every four hours for four days to inhibit the metabolism of methanol. If respiratory difficulties develop, oxygen and artificial respiration should be administered. Obtain medical advice by radio. Prompt evacuation of the patient from the vessel may be indicated.

Salicylates

(as Aspirin, Methyl Salicylate or Oil of Wintergreen)

Poisoning by a salicylate results in rapid, deep, and pauseless breathing because of the direct effect on the brain. Vomiting, extreme thirst, profuse sweating, fever, and convulsions or delirium may occur. Shock, coma, convulsions, a decreased urine output, and blood in vomitus may appear as the intoxication becomes severe.

Treatment

Unless the patient is convulsing or unconscious, vomiting should be induced immediately or a gastric lavage performed. For an adult, 50 or more tablets of aspirin, 300 mg (5 grains) would be a potentially poisonous quantity. Also, about 15 ml (½ ounce) of oil of wintergreen may be poisonous. If convulsions occur, the treatment given on page V–78 should be followed. Seek medical advice by radio.

Pesticides

(as Arsenic, Sodium Fluoride, Organophosphates, Carbamates)

Pesticides are used to poison insects and other animals.

- *Arsenic*

After arsenic is ingested, symptoms develop in a few minutes or hours. Intense upper abdominal pain is followed by violent vomiting and profuse diarrhea. At first, the vomitus and stools usually contain blood and mucus; and later, the stools assume a "rice-water" appearance. There may be a garlic odor to the breath and stools. These symptoms are followed quickly by exhaustion and collapse.

Treatment

The poisonous arsenic should be removed by repeated vomiting or gastric lavage. A large amount of water should be given, followed by milk of magnesia. After initial treatment has been administered, arrangements should be made for prompt evacuation of the patient.

- *Sodium Fluoride*

Sodium fluoride poisoning causes nausea, vomiting, diarrhea, and abdominal pain. These symptoms generally are not as severe as those produced by caustic and corrosive poisons, or arsenic. These symptoms are followed by a twitching muscular movement related to hypocalcemia, and later by muscular weakness and collapse.

Treatment

Vomiting should be induced to remove sodium fluoride from the stomach. Repeatedly administer large quantities of milk. The patient should be placed in bed and kept as quiet as possible. On the advice of a physician, 2 to 10 ml of 10% calcium gluconate may be given very slowly intravenously, until muscular twitching stops. After the initial treatment, immediate evacuation of the patient from the vessel should be arranged.

- ***Organophosphate pesticides*** *(as Parathion,® Diazinon®)* ***and Carbamates*** *(as Carbacryl®)*

Organophosphates and carbamates are very toxic compounds that are absorbed by the skin, lungs, and gastrointestinal tract. The symptoms include all or some of the following: weakness, blurred vision, contraction of the pupil of the eye, and tightness in the chest. These are followed by vomiting, cramping, diarrhea, salivation, weeping eye, sweating, tremors, difficult breathing, bluish color to skin and mucous membranes, coma, and convulsions.

Treatment

For organophosphate and carbamate poisoning treatment includes maintaining respiration, administering oxygen, and injecting 2 to 4 mg of atropine intramuscularly at 5- to 10-minute intervals, until the patient's skin is flushed and dry, and mild tachycardia (rapid pulse) occurs. Contaminated clothing should be removed and the contaminated skin washed thoroughly with soap and water. In cyanotic patients, oxygen should be given to overcome cyanosis (bluish tint to skin) before administering atropine. Obtain medical advice by radio. After the initial treatment, arrangements should be made for prompt evacuation of the patient from the vessel to a medical facility.

Heavy Metals

(as Lead, Mercury and their Salts)

Heavy metal poisoning and its treatment are usually chronic; however, single ingestions or exposures, or symptoms may be acute. Generally, the salts of heavy metals, rather than actual metallic lead or mercury are most poisonous if ingested. *Mercury chloride (corrosive sublimate) is extremely poisonous if ingested.* Inhalation of vapors of these substances or skin or eye contact may also be harmful.

Treatment

Following ingestion of heavy metals or their salts, vomiting should be induced with syrup of ipecac. Follow with activated charcoal and/or milk. Appropriate symptomatic and supportive care should be given. If vapors have been inhaled, remove the patient from the contaminated area and administer oxygen. For skin or eye contact, flush with large amounts of water. *In all cases, seek medical advice by radio.*